

0171942en	001
0907	

Hydronic Air Heater

Pureheat

OPERATOR'S MANUAL



0 1 7 1 9 4 2 E N



One Year Limited Warranty

(see your distributor to file warranty claim)

Ground Heaters, Inc. warrants that the Products described in this Limited Warranty shall be free of defects in material and workmanship under normal use and service for a period of one year from the Ground Heaters, Inc. invoice date to Distributor or for a period of one year from Distributor's invoice date to end-user, excluding pre-season orders which will have an effective warranty date of November 15th. This Limited Warranty is expressly limited to crediting the purchase price of the defective Product or to repairing or replacing the defective Product, at the sole option of Ground Heaters, Inc. This warranty shall not extend to any repair work performed by anyone other than Ground Heaters, Inc. or an authorized representative of Ground Heaters, Inc. Such credit, repair or replacement shall be Ground Heaters, Inc.'s sole obligation and buyer's exclusive remedy hereunder and shall be conditioned upon Ground Heaters, Inc.'s timely receipt of warranty claim of the alleged defect and, at Ground Heaters, Inc.'s option, return of such product to Ground Heaters, Inc., FOB its Spring Lake, Michigan, facility. Any warranty claims received after 13 months from warranty effective date are not valid. This exclusive remedy shall not be deemed to have failed of its essential purpose provided Ground Heaters, Inc. is willing and able to repair or replace the defective Product or to credit the purchase price within 90 days of the date on which Ground Heaters, Inc. confirms that such products are defective. Use of repair or replacement parts not manufactured by Ground Heaters, Inc. may void this warranty. Ground Heaters, Inc.'s liability hereunder shall be limited to the contract price of that portion of the Product on which such liability is based. The existence of a defect shall be determined by Ground Heaters, Inc. in its sole discretion.

GROUND HEATERS, INC. SHALL NOT BE RESPONSIBLE FOR ANY LABOR CHARGES OR LOST HEAT TRANSFER FLUID IN CONNECTION WITH WARRANTY SERVICE. USE OF ANY ANTI-FREEZE OR HEAT TRANSFER FLUID OTHER THAN GROUND HEATERS BRAND HEAT TRANSFER FLUID VOIDS THIS WARRANTY IN ITS ENTIRETY.

THIS WARRANTY IS EXCLUSIVE. WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND WARRANTIES ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE, ARE SPECIFICALLY EXCLUDED, AND THERE ARE NO WARRANTIES EXPRESSED OR IMPLIED OTHER THAN THE LIMITED WARRANTY EXPRESSLY SET FORTH HEREIN.

GROUND HEATERS, INC. SHALL NOT BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL OR OTHER DAMAGES, INCLUDING BUT NOT LIMITED TO DAMAGES FOR LOSS OF PROFITS OR PRODUCTION, OR INJURY TO PERSON OR PROPERTY. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, GROUND HEATERS, INC. SHALL NOT BE LIABLE FOR ANY CLAIMS BASED ON THE CONDITION, USE OR OPERATION OF THE PRODUCTS, WHETHER BASED ON CONTRACT, TORT OR OTHER THEORIES OF LAW, INCLUDING WITHOUT LIMITATIONS, THEORIES OF NEGLIGENCE.

The "Products" covered by this Limited Warranty include all machines manufactured by Ground Heaters, Inc. and sold in the ordinary course of business, and all accessories therefore, which are registered with Ground Heaters, Inc., except for the following components: Heat Transfer Hoses, Tires, Generator Powerheads and Engines. These are considered to be wear items and/or are covered by warranties of the component manufacturer. NOTE: Failure to maintain proper inflation or operating tires at speeds or under loads in excess of those recommended in the operator's manual may void the tire manufacturer's warranty. Failure to fully pay for Product will void this Limited Warranty.

No agent or employee of Ground Heaters, Inc. is authorized to modify, extend, or otherwise change this limited warranty.



Technical Assistance

877-799-9600

This Pureheat™ Hydronic Air Heater manual contains the following:

- 1. Pureheat™ Hydronic Air Heater Operator's Manual**
- 2. One Year Limited Warranty**
- 3. Pump Manufacturer's Manual**
- 4. Burner Manufacturer's Manual**



WARNING

LICENSED GAS TECHNICIAN REQUIRED.

NG/LP BURNER SETUP AND INSTALLATION, FUEL SUPPLY CONNECTION, TEST FIRING AND BURNER ADJUSTMENT MUST BE PERFORMED BY A LICENSED PROFESSIONAL GAS TECHNICIAN AND MUST CONFORM TO THE REQUIREMENTS OF ALL RELEVANT LOCAL, STATE, PROVINCIAL AND FEDERAL AUTHORITIES.

Burner setup and installation, fuel supply connection, test-firing and burner adjustment must be performed by a licensed professional and must conform to the requirements of local, state and federal authorities. In the Commonwealth of Massachusetts, gas piping shall be installed by a licensed plumber or gas fitter.

The licensed gas technician must use a manometer (to properly adjust gas pressure) and an electronic combustion analyzer (to properly adjust burner air intake and verify that proper combustion parameters have been achieved). The licensed gas technician must supply all fuel lines, fittings, regulators, etc. necessary to connect the Pureheat™ NG/LP burner to the fuel source at the correct pressure and flow.

**FAILURE TO HEED THIS WARNING MAY RESULT IN
AN EXPLOSION AND/OR FIRE CAUSING
PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**



WARNING: If the instructions in this manual are not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- **WHAT TO DO IF YOU SMELL GAS**
 - Do not try to light any appliance
 - Do not touch any electrical switch; do not use any phone in your building
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

Operator Manual available in French language upon request. Call 877-799-9600.
Manuel de renseignements disponible en langue française sur demande.
Appellez le 877-799-9600.

TABLE OF CONTENTS

	<u>Page</u>
Technical, Checklists, Warranty Information	i
Warnings	ii, iii
Specifications	ix
List of Abbreviations	x

INTRODUCTION

1.1	EXTERNAL FEATURES	1-2
1.2	INTERNAL COMPONENTS	1-3
1.2.1	Heater with Burner Options	1-3
1.2.2	Heater with Burner Detail	1-4
1.2.3	Inside Rear Doors	1-5
1.3	IDENTIFICATION	1-6
1.4	SAFETY FEATURES	1-6
1.5	SAFETY PRECAUTIONS	1-6
1.5.1	Burner Setup, Installation and Adjustment Requirements	1-7
1.5.2	Operators	1-7
1.5.3	Safe Operation and Maintenance	1-7
1.6	REPAIR PARTS AND ACCESSORIES	1-8
1.7	MAINTENANCE	1-8
1.8	OBTAINING WARRANTY SERVICE	1-8

START UP, OPERATION AND SHUTDOWN

2.1	CIRCULATION SYSTEM ADVISORY	2-1
2.1.1	Standard Configuration Performance	2-1
2.1.1.1	HX200 Heat Xchangers™	2-1
2.1.1.2	HX200 Heat Xchangers™ with Optional Booster Pump	2-1
2.1.1.3	HX100 Heat Xchangers™	2-1
2.1.1.4	HX100 Heat Xchangers™ with Booster Pump	2-1
2.1.1.5	HX50 Heat Xchangers™	2-2
2.1.1.6	HX50 Heat Xchangers™ with Booster Pump	2-2
2.1.1.7	Maximum Heat Xchanger™ Connection Capability	2-2
2.1.2	Optional Booster Pump	2-2
2.1.3	Circulation Hose Limitations	2-2
2.1.4	Insulate Circulation Hoses	2-3
2.1.5	Circulation Hose Protection	2-3
2.2	PRE-START UP CHECKS	2-3
2.2.1	Positioning	2-3
2.2.2	Unloading HX200 Heat Xchangers™	2-3
2.2.3	Unloading HX100 Heat Xchangers™	2-4
2.2.4	Unloading HX50 Heat Xchangers™	2-4

TABLE OF CONTENTS (continued)

	Page
2.2.5 Heat Transfer Fluid (HTF).....	2-4
2.2.6 Switch Positions.....	2-4
2.2.7 Deployment of Circulation Hoses or Option Heat Transfer Hose.....	2-5
2.3 SETUP	2-5
2.4 START UP	2-5
2.4.1 Integrity Check.....	2-5
2.4.2 Warming the Heat Transfer Fluid	2-6
2.4.3 Initiating Flow through Heat Transfer Hose	2-6
2.5 OPERATING WITH OPTIONAL ACCESSORIES	2-7
2.5.1 Using Three HHS3004 with Booster Pump for Thawing Applications.....	2-7
2.5.2 Using Five HHS3004 with Booster Pump for Curing and Frost Prevention Applications	2-7
2.6 MONITORING OPERATING PARAMETERS	2-8
2.7 UNIT SHUTDOWN	2-9
2.7.1 Burner Shutdown	2-9
2.7.2 Disconnecting Hoses from Heat Xchangers™ and Pureheat	2-9
2.7.3 Rewinding the Circulation Hose	2-9
2.7.4 Completing Unit Shutdown	2-10
2.8 CONNECTING/DISCONNECTING OPTIONAL BOOSTER PUMP	2-10
2.8.1 Connecting.....	2-10
2.8.2 Start Up.....	2-11
2.8.3 Shutdown	2-11
2.8.4 Disconnecting	2-11
 BURNER ADJUSTMENT AND SHUTDOWN	
3.1 NATURAL GAS/LIQUID PROPANE VAPOR	3-1
3.1.1 Burner Adjustment	3-1
3.1.1.1 Fuel Pressure Adjustment	3-2
3.1.1.2 Air Setting and Adjustment	3-2
3.1.1.3 O ₂ Content Sampling	3-3
3.1.1.4 Smoke Spot Sampling	3-3
3.1.2 Burner Shutdown	3-3
3.2 DIESEL/FUEL OIL	3-3
3.2.1 Burner Adjustment	3-3
3.2.1.1 Fuel Pressure Adjustment	3-4
3.2.1.2 Air Setting and Adjustment	3-4
3.2.1.3 O ₂ Content Sampling	3-4
3.2.1.4 Smoke Spot Sampling	3-4
3.2.2 Burner Shutdown	3-5

TABLE OF CONTENTS (continued)

	<u>Page</u>
MAINTENANCE	
4.1 ADDING HEAT TRANSFER FLUID	4-1
4.1.1 To Clear a "LOW LEVEL FAULT"	4-1
4.2 BURNER INSTALLATION/CHANGEOVER	4-2
4.2.1 From NG/LP to Diesel/Fuel Oil	4-2
4.2.1.1 Installation	4-2
4.2.1.2 Setup	4-3
4.2.2 From Diesel/Fuel Oil to NG/LP	4-3
4.2.2.1 Installation	4-4
4.2.2.2 Setup	4-4
4.3 HIGH ELEVATION OPERATIONS.....	4-5
4.4 RECOMMENDED FUELS	4-5
4.5 SUMMER STORAGE INSTRUCTIONS	4-6
4.6 PRE-SEASON MAINTENANCE.....	4-6
 TRANSPORTING THE PUREHEAT™ HYDRONIC AIR HEATER	
5.1 TOWING.....	5-1
5.2 AERIAL LIFTING	5-1
5.3 TRANSPORTING on a FLATBED	5-1
5.4 COMMON MECHANICAL INSPECTIONS PRIOR TO TRANSPORTING	5-1
 TROUBLESHOOTING	
6.1 TROUBLESHOOTING CHART	6-1
6.2 HTF LOW LEVEL FAULT AND LIGHTS	6-3
6.2.1 Low Level Shutdown Device	6-3
6.2.2 Testing the Low Level Shutdown Device	6-3
6.3 BURNER CONTROL LOCKOUT	6-4
6.3.1 Gas Burner Control.....	6-4
6.3.2 Oil Burner Control.....	6-4

TABLE OF CONTENTS (continued)

	<u>Page</u>
APPENDIX A	
PUREHEAT SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND	A-1a
PUREHEAT SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND	A-1b
PUREHEAT SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND	A-1c
PUREHEAT CONTROL PANEL EXTERIOR LAYOUT	A-2
PUREHEAT TEMPERATURE CONTROL	A-3
PUREHEAT CONTROL PANEL DOOR INTERIOR LAYOUT	A-4
PUREHEAT MAIN CONTROL PANEL - EXTERIOR COMPONENT FUNCTION AND IDENTIFICATION	A-5
PUREHEAT MAIN CONTROL PANEL INTERIOR COMPONENT LAYOUT	A-6
PUREHEAT MAIN CONTROL PANEL INTERIOR COMPONENT FUNCTION AND IDENTIFICATION	A-7
PUREHEAT WIRING SCHEMATIC – CIRCUIT 1	A-8
PUREHEAT WIRING SCHEMATIC - CIRCUIT 1 WITH DIESEL BURNER	A-9
PUREHEAT SAFETY CONTROLS – DIESEL BURNER WIRING	A-10
PUREHEAT WIRING SCHEMATIC - CIRCUIT 1 WITH NP/LP BURNER	A-11
PUREHEAT DIESEL BURNER CONTROL SEQUENCE OF OPERATION AND LOCKOUT	A-12
PUREHEAT SAFETY CONTROLS NG/LP BURNER WIRING DIAGRAM	A-13
PUREHEAT WIRING SCHEMATIC – CIRCUIT 2	A-14
PUREHEAT SCHEMATIC - AUXILIARY PUMP PANEL (P/N A109-199)	A-15
PUREHEAT CIRCULATION - BOOSTER PUMP MOTOR WIRING	A-16
PUREHEAT REWIND MOTOR WIRING	A-17
PUREHEAT SAFETY CONTROLS LOW LEVEL SHUTDOWN DEVICE (P/N E100-198)	A-18
HX200 HEAT XCHANGER™ WIRING DIAGRAM	A-19
HX100 HEAT XCHANGER™ WIRING DIAGRAM	A-20
HX50 HEAT XCHANGER™ WIRING DIAGRAM	A-21
PUREHEAT TRAILER JUNCTION BOX AND BATTERY WIRING	A-22
PUREHEAT TRAILER WIRING	A-23
PUREHEAT NG/LP BURNER COMPONENT IDENTIFICATION (P/N P100-673)	A-24
PUREHEAT NG/LP BURNER (P/N P100-673) GAS PRESSURE CHECKING AND ADJUSTING	A-25
PUREHEAT DIESEL BURNER COMPONENT IDENTIFICATION (P/N P100-690)	A-26
SUGGESTED METHOD FOR SECURING THE PUREHEAT ONTO A TRUCK BED	A-27
PUREHEAT HOSE REWIND PARTS IDENTIFICATION	A-28

TABLE OF CONTENTS (continued)

	<u>Page</u>
APPENDIX B	
PUREHEAT AIR AND SURFACE HEATING ACCESSORIES.....	B-1
BOOSTER PUMP TO PUREHEAT CONNECTING	B-2
HX200 HEAT XCHANGER™ TO PUREHEAT CONNECTION LAYOUT	B-3
HX100 HEAT XCHANGER™ TO PUREHEAT CONNECTION LAYOUT	B-4
HX50 HEAT XCHANGER™ TO PUREHEAT CONNECTION LAYOUT	B-5
PUREHEAT 18,000 SQ. FT THAW LAYOUT (THREE HHS 3004'S AND THREE 4-PORT MANIFOLDS)	B-6
PUREHEAT 30,000 SQ. FT CURE LAYOUT (FIVE HHS 3004'S AND FIVE 4-PORT MANIFOLDS)	B-7
PUREHEAT 45,000 SQ. FT FROST PREVENTION LAYOUT (FIVE HHS 3004'S AND FIVE 4-PORT MANIFOLDS).....	B-8
PUREHEAT VALVE POSITIONS FOR ADDING HTF (MACHINE IN USE).....	B-9
PUREHEAT VALVE POSITIONS FOR ADDING HTF (MACHINE NOT IN USE)	B-10
PUREHEAT QUICK-CONNECT AND CAM-LOCK CARE AND MAINTENANCE.....	B-11
 APPENDIX C	
PUREHEAT APPLICATIONS AND CAPACITIES	C-1

SPECIFICATIONS

Dimensions and Capacities	
Length	172 in. (437 cm)
Width	93 in. (236 cm)
Height	93 in. (236 cm)
Ground Clearance	9 in. (23 cm)
Weight	7,155 lbs (3,248 kg)
Optional Diesel Fuel Tank	435 US gallons (1,647 liters)
Weight with Optional Diesel Fuel Tank	11,230 lbs (5,098 kg)
Heat Transfer Fluid	145 US gallons (549 liters)
Pump, 1.5 hp Centrifugal	1
Circulation Hose	Total: 1,000 ft (305 m) (see breakdown below)
	4 x 100 ft [30 m]
	4 x 50 ft [15 m]
Hose Reel	1
Hose Rewind	120 VAC, w/12 VDC clutch
Circulation Loops	5
Tires	LT235/85R16
Tire Inflation	80 psig (752 kPa) cold
Hitch	3 in. Pintle or 2 5/16 in. Ball
Heat Exchangers	200,000 BTU/H (2,400 cfm) 4
	100,000 BTU/H (1,315 cfm) 8
	50,000 BTU/H (710 cfm) 16
Remote Manifold (not included with HX200 package)	4
Loading Ramp (not included with HX50 package)	1
On-Board Manifold (Supply/Return)	1
Lifting Bail	Standard



Performance (choice of fuels)	
Burner Orifice (NG/LP Burner)	5/8 in
Propane, Input	860,000 BTU/H
Natural Gas, Input	860,000 BTU/H
Burner Nozzle (Diesel Burner) 5.0 60° A (solid)	
Diesel, Input	860,000 BTU/H
Efficiency	83%
Temperature Control	Digital
Fuel Consumption During Burner Operation:	
	(Propane) 344 CFH
	(Natural Gas) 860 CFH
	(Diesel) 6.1 GPH
Electrical Requirement	1 x 15 amp. and 1 x 20 amp. x 120 VAC
Normal Operating Temperature	180°F (82 °C)



LIST OF ABBREVIATIONS

The following is a list of abbreviations used throughout the Operator's Manual:

<u>Abbreviation/Symbol</u>	<u>Term/Meaning</u>
amp.	ampere (measurement of electrical current)
asl	above sea level
BTU	British Thermal Unit (measurement of heat energy)
°C	degrees Celsius (metric measurement of temperature)
CFM	Cubic Feet per Minute (measurement of air flow)
cm	centimeter (1/100 th of a meter)
CSA	Canadian Standards Association
°F	degrees Fahrenheit (measurement of temperature)
ft	foot/feet (measurement of length/distance)
ft ²	square foot/square feet (measurement of area)
ft-lbs	foot pounds (measurement of torque)
gph	gallons per hour (measurement of liquid flow)
GFI	Ground Fault Interrupt/interrupter (protection device)
GHI	Ground Heaters, Incorporated
GVWR	Gross Vehicle Weight Rating
HHS	Ground Heaters Hose Handling System
hr	hour (measurement of time)
HTF	Ground Heaters Heat Transfer Fluid
Hz	Hertz (measurement of frequency)
ID	measurement of Inner Diameter
in.	inch/inches (measurement of length/distance)
kg	kilogram (metric measurement of weight)
Kilo-Cal	Kilo-Calorie = 1000 Calories (metric measurement of heat energy)
kPa	kilo-Pascals (metric measurement of pressure)
kW	kilo-Watt (measurement of electrical power)
lb	pound (measurement of weight)
LWCO	Low Water Cut Off Device
m	meter (metric measurement of length/distance)
MGV	Main Gas Valve (NG / LP Fuel)
mm	millimeter (1/1000 th of a meter)
NHTSA	National Highway Transportation Safety Administration
psig	pounds per square inch gauge (measurement of pressure)
Rev.	Revision
TC	Temperature Controller
USDOT	United States Department of Transportation
V.	Version
VAC	Volts, Alternating Current
VDC	Volts, Direct Current

INTRODUCTION

The Pureheat™ Hydronic Air Heater provides temporary air heat, thaws frozen ground, cures concrete and provides frost prevention at ambient temperatures below 40°F (5°C). Ground Heaters, Inc.'s revolutionary technology enables construction activities to continue throughout the cold weather months.

The Pureheat™ Hydronic Air Heater is equipped with a 5-Port On-Board Manifold and 1,000 ft (396 m) of 1 in. (25 mm) ID Red Circulation Hose Assemblies with Quick-Connects (QCs). The standard equipment package includes the following lengths of Circulation Hoses: Two (2) 200 ft (61 m), Four (4) 100 ft. (30 m), Four (4) 50 ft (15 m). The optional diesel or gas Burner heats the Heat Transfer Fluid (HTF) to 180°F (82°C). The HTF is continuously circulated through the Circulation Hoses in a vented, closed-loop system.

With standard equipment, the Pureheat:
(Refer to Appendixes B and C)

- Provides remote space heating for up to 1,200,000 ft³ (48,235 m³) of building space.

Using GHI's optional Booster Pump and Auxiliary Pump Panel, Three (3) Hose Handling System 3004 (HHS3004) with Twelve (12) 750 ft (228 m) 5/8 in. ID Heat Transfer Hoses (HTH) and three 4-Port Remote Manifolds, the Pureheat will:

- Thaw up to 18,000 ft² (1,674 m²) of frozen ground per application using 24 in. (60 cm) hose spacing.
- Thaw up to 9,000 ft² (837 m²) 75% to 100% faster using 12 in. (30 cm) hose spacing

Using GHI's optional Booster Pump and Auxiliary Pump Panel, Five (5) Hose Handling System 3004 (HHS3004) with Twenty (20) 750 ft (228 m) 5/8 in. ID Heat Transfer Hoses (HTH) and Five (5) 4-Port Remote Manifolds, the Pureheat can:

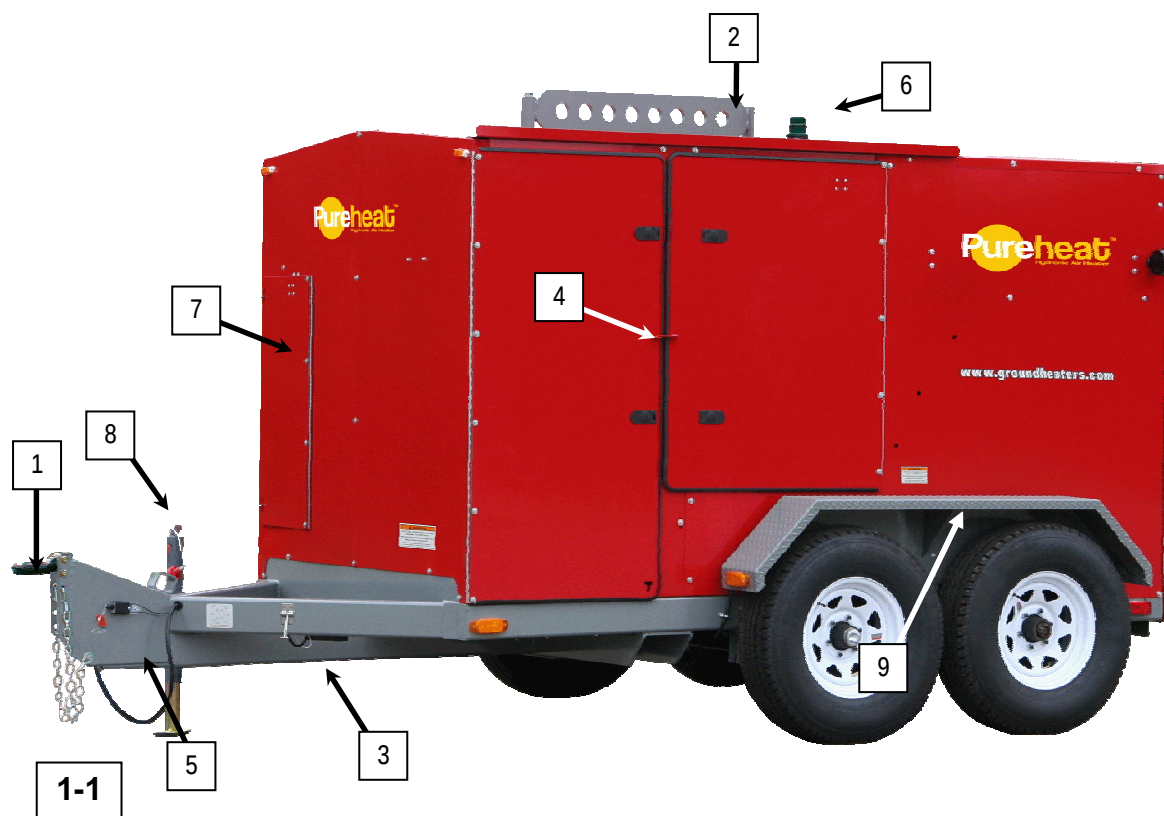
- Cure all types of concrete placements, including slabs on grade, elevated slabs, tilt-up walls, poured walls, columns, footings, bridge decks, etc. up to 30,000 ft² (2,790 m²) per application using 24 in. (60 cm) hose spacing.
- Provides Frost Prevention up to 45,000 ft² (4,186 m²) per application using 36 in. (91 cm) hose spacing.

The Pureheat™ Hydronic Air Heater Model Pureheat:

- Heats workspace easily & economically:
 - Input of 860,000 BTUH.
 - Fuel flexible; choice of natural gas, propane or diesel.
 - Takes only minutes to change over from one fuel to another.
- Provides pure, dry, hot air – no moisture added to workspace; prevents mold and mildew.
- Removes excess moisture – dry / warm air removes moisture from workspace and building materials.
- Provides pure, clean air – no combustion by-products in workspace.
- Is self-contained – all system components are on One (1) trailer.
- Is rental friendly – easy setup and uses only One (1) 15 amp. And One (1) 20 amp. 120 volts AC circuits.
- Is multi-functional – with accessories, this system can be used as a surface heater.

1.1 EXTERNAL FEATURES (Photo 1-1)

1. Adjustable 3 in. (76 mm) Pintle Style Hitch or 2⁵/₁₆ in. (59 mm) Ball
2. Lifting Bail
3. Door Tieback
4. Lockable Doors
5. Electric Brakes with Breakaway Switch
6. Performance Monitoring Light
7. 5-Port On-Board Manifold Door
8. Heavy Duty Jack-Stand
9. Heavy Duty Fenders

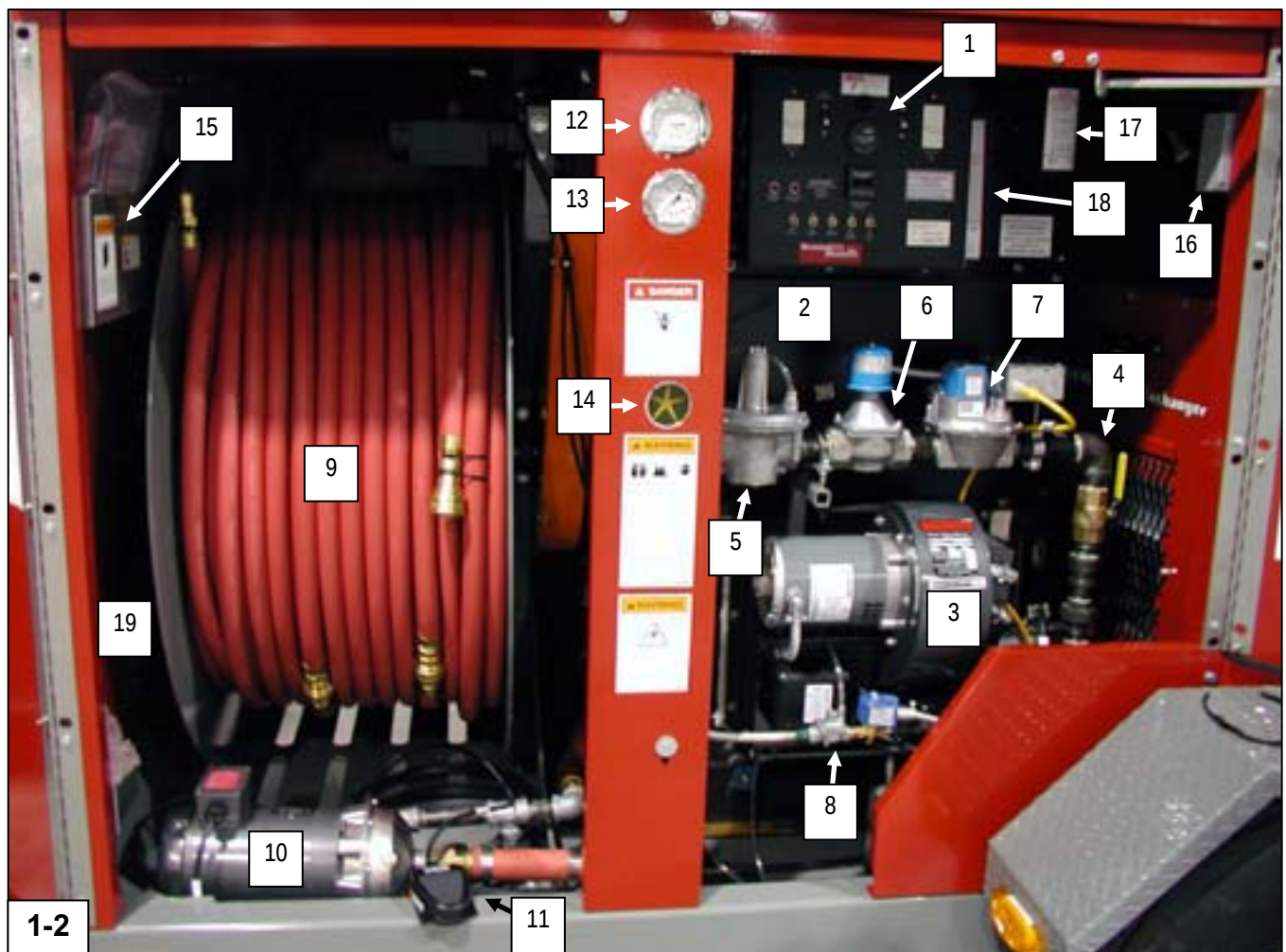


1.2 INTERNAL COMPONENTS (Photos 1-2 through 1-6)

1.2.1 Heater with Burner Options (Photo 1-2)

The following components are accessed via the side door:

- | | |
|---|---|
| 1. Main Control Panel | 10. Main Pump |
| 2. Hydronic Heater and Expansion Tank (not shown) | 11. Rewind Foot Pedal |
| 3. Natural Gas (NG)/Liquid Propane (LP) Burner | 12. Return Temperature Gauge |
| 4. NG/LP Gas Train | 13. Pressure Gauge |
| 5. NG/LP Gas Pressure Regulator | 14. Return Flow Indicator |
| 6. NG/LP Main Gas Valve | 15. Operator's Manual Holder |
| 7. NG/LP Secondary Gas Valve | 16. Performance Monitoring Power Receptacle |
| 8. NG/LP Pilot Gas Valve | 17. Low Level Shutdown Device |
| 9. Hose Reel with 1,000 ft (305 m) 1 in. ID | 18. HTF Sight Gauge and Decal |
| Red Circulation Hoses with Quick-Connects (QCs) | 19. Optional Auxiliary Pump Panel (not shown) |

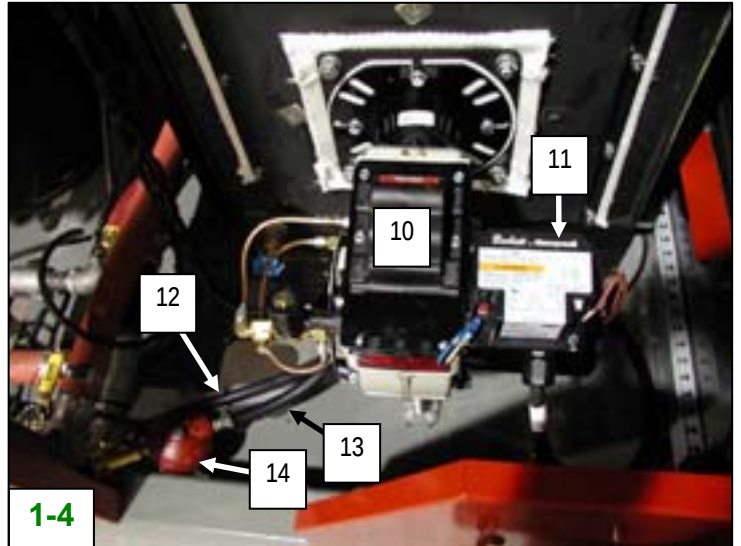
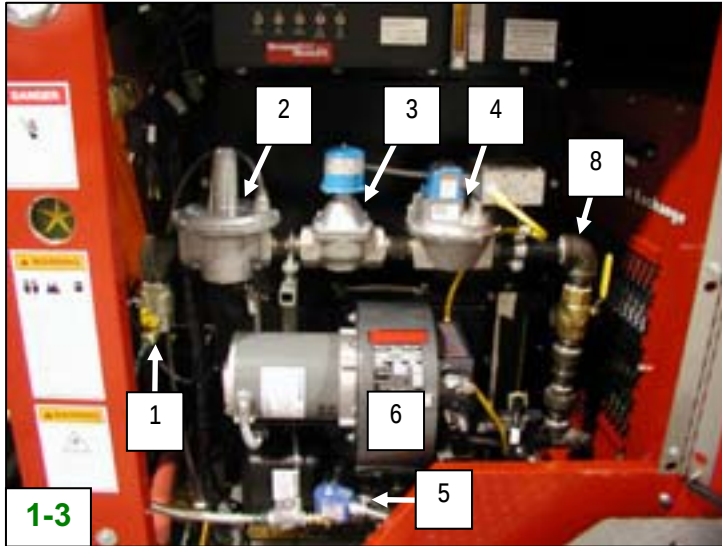




1.2.2 Heater with Optional Burner Detail (Photos 1-3 and 1-4)

The following components are accessed via the Side Door:

- | | |
|---|-------------------------------------|
| 1. Natural Gas (NG)/Liquid Propane (LP) Supply Gas Connection | 8. NG/LP Gas Train |
| 2. NG/LP Gas Pressure Regulator | 9. NG/LP Burner Control (not shown) |
| 3. NG/LP Main Gas Valve | 10. Diesel Burner |
| 4. NG/LP Secondary Gas Valve | 11. Diesel Burner Control |
| 5. NG/LP Pilot Gas Valve | 12. Diesel Return Fuel Line and QC |
| 6. NG/ LP Gas Burner | 13. Diesel Supply Fuel Line and QC |
| | 14. Diesel Fuel Filter and QC |



1.2.3 Inside Rear Doors

The following components are located inside the Rear Door: (Photo 1-5 through 1-8)

1. HX200 Heat Xchangers™
2. Cab Interior Light and Remote Manifold Storage Location – not shown)
3. Ramp Alignment Pins
4. Ramp Storage and Remote Manifold Storage (not shown)



HX50 (LOADED)



HX100 (LOADED)



HX200 (LOADED)

1.3 IDENTIFICATION

The Pureheat™ Hydronic Air Heater serial number is located on the Main Control Panel. Always reference the Pureheat serial number when ordering parts or requesting technical assistance.

1.4 SAFETY FEATURES

Pureheat™ Hydronic Air Heaters are safe, quality equipment, are NHTSA compliant, meet all state requirements, meet all Transport Canada requirements, and are CSA certified.

Specific safety features include:

1. Trailer Brakes: electric with breakaway switch (12 VDC).
2. Hydronic Heater: operates at zero (atmospheric) pressure.
3. Low Level Shutdown Device: turns off the Burner and Pumps if HTF level in the system drops below minimum operating level. Manual reset requirement prevents unsupervised Pump/Burner start up.
4. Ground Fault Interrupters (GFI): built into control panel to protect all circuits.
5. Circuit Overload Protection: built into Main Control Panel to protect all circuits and components.
6. Burner Flame Monitoring: Burner Control uses optic flame sensor to shut off Burner if flame fails to ignite or upon loss of flame. Manual reset requirement prevents unsupervised restart.
7. Pump Motor Overload Protection: internal thermal overload trip with automatic reset.
8. Burner Motor Overload Protection: internal thermal overload trip with manual reset (diesel Burner Motor only) and internal thermal overload trip with automatic reset (NG/LP only).
9. Reflective Markers: enhance night identification.
10. Foot Pedal: for Hose Rewind system wired with low voltage (12 VDC) signal to protect personnel from shock hazard should the Foot Pedal become accidentally immersed in water.
11. Digital Temperature Control: fails safe (Burner OFF) upon loss of power or temperature sensor malfunction
12. System Over Temperature Backup Shutdown: Bi-metal snap disc will shut down the Burner Blower Motor should HTF temperature exceed 200°F.
13. Natural Gas (NG) / Propane (LP) Burner:
 - a. Ten (10) Second Pre-Purge Timer
 - b. Automatic Burner Sequencing
 - c. Flame Monitoring
 - d. System Status Indication
 - e. System / Self-Diagnostics
 - f. Post-Purge Timer
 - g. Pilot Valve / Ignition
 - h. Infrared Flame Detector
 - i. Air Flow Proving Switch

1.5 SAFETY PRECAUTIONS

Ground Heaters, Inc. develops and manufactures equipment that is safe to operate. However, an accident could occur if the Pureheat™ Hydronic Air Heater is used improperly. Safe operation requires that all instructions and precautions be followed. Key safety precautions are posted on decals throughout the machine. Read and understand all material in this Operator's Manual and on the decals posted on the Pureheat before attempting to operate it.

1.5.1 Burner Setup, Installation and Adjustment Requirements

Licensed gas technician required. NG/LP Burner setup and installation, fuel supply connection, test firing and Burner adjustment must be performed by a licensed professional gas technician and must conform to the requirements of all relevant local, state, provincial and federal authorities. The licensed gas technician must use Two (2) Manometers to properly adjust supply and manifold gas pressure. A Combustion Analyzer and Smoke Spot Tester must be used to properly adjust Burner emissions and verify that proper combustion parameters (O₂, Exhaust temperature and smoke) have been achieved. The licensed gas technician must supply all fuel lines, fittings, regulators, etc. necessary to connect the Pureheat NG/LP Burner to the fuel source at the correct pressure and volume.

NOTE: In the Commonwealth of Massachusetts, gas piping shall be installed by a licensed plumber or gas fitter.

Diesel Burner setup, installation and adjustment must be performed by a trained and knowledgeable Diesel Burner technician. The Diesel Burner technician must use a Fuel Pressure Test Gauge to properly adjust the fuel pressure. A Combustion Analyzer and a Smoke Spot Tester must be used to properly adjust Burner emissions and to verify that proper combustion parameters (O₂, Exhaust temperature and smoke) have been achieved.

1.5.2 Operators

There are no published standards or certification requirements for operating portable hydronic heating machines. The following criteria reflect the experience of Ground Heaters, Inc. and should be considered a guide, not a comprehensive requirement. The following operator characteristics will prevent accidents, facilitate satisfactory results, and ensure reliable service from the Pureheat™ Hydronic Air Heater.

1. Patience: Insures the system runs at optimum levels; leaks are found and fixed; valves are properly set; and switches are activated properly.
2. Good Hearing, Vision and Smell: Enables operator to assess equipment and detect potential malfunctions.
3. Self Respect: Dresses for the weather; wears eye protection and gloves; and does not take chances with personal safety. Do not operate the Pureheat while intoxicated or impaired by alcohol or other substances.
4. Careful and Responsible: Insures the machine is operating properly before leaving it unattended; keeps track of fluid levels; locks compartments; conducts operational checks at regular intervals; and ensures proper officials are notified of the machine's use.
5. Above all, a Pureheat™ Air Heater operator reads and understands this Operator's Manual and the decals posted on the machine.



Failure to adhere to all safety precautions and recommendations may result in damage to the Pureheat™ Air Heater™, damage to other property, personal injury, or possibly death.

1.5.3 Safe Operation and Maintenance

1. Read and understand all material in this Operator's Manual and on the decals posted on the Pureheat™ Air Heater before attempting to operate it.
2. Keep unauthorized people, especially children, away from the Pureheat.
3. Keep guards in place. Do not disable safety features.
4. Keep safety and instruction decals clean and legible. Replace damaged decals.
5. Do not operate the Burner while the Pureheat™ Hydronic Air Heater is in an enclosed, non-ventilated area. The Burner Exhaust contains carbon monoxide, a colorless, odorless and deadly gas.
6. Locate the Pureheat on firm/level ground and chock wheels before operating.
7. Do not smoke while refueling. Do not refuel near open flame or sparks.
8. Clean up fuel spills immediately.



9. Do not transport people in or on the Pureheat™ Hydronic Air Heater.
10. If the Pureheat starts to function improperly, turn OFF immediately and repair before restarting.
11. Always wear gloves when handling hot or cold components—especially the Circulation Hose. Never loosen or remove Circulation Hoses while a Pump or Burner is running or when the HTF temperature is above 120°F (49°C).
12. Do not attempt tire repairs. Have a qualified tire dealer or repair service perform required tire maintenance.
13. Torque for wheel lug nuts should be set at 110 ft-lbs.



Failure to observe these warnings may result in injury or death.

1.6 **REPAIR PARTS AND ACCESSORIES**

Your Ground Heaters Distributor carries a complete line of parts and accessories needed for all repair or replacement requirements.

1.7 **MAINTENANCE**

All maintenance should be performed by a qualified service technician using the Operators Manual.

The following preventative maintenance should be performed once per year or every 1,500 hours, whichever comes first:

- Hydronic Heater and Burner cleaning and inspection (Refer to section 3 of the Service Manual.)
- Low Level Shutdown Device operation verification (Refer to Appendix A-18, Pureheat Safety Controls Low Level Shutdown Device).
- Temperature Control accuracy and operation verification (refer to section 2.1.5 of the Service Manual).
- Routine Trailer Axle maintenance (common mechanical experience).

1.8 **OBTAINING WARRANTY SERVICE**

Your satisfaction is important to your Ground Heaters Distributor as well as to Ground Heaters, Inc. Warranty details are explained in the Ground Heaters, Inc. Statement of Warranty found on the reverse side of the Customer Delivery Checklist.

All warranty services must be completed by a certified Ground Heaters Distributor service technician. If your Distributor does not satisfactorily resolve the problem, please call Ground Heaters, Inc. at 877-799-9600 for assistance. You will need to provide the following information for assistance:

- Name, address and phone number
- Machine serial number
- Date of purchase
- Distributor name and address (location)
- Nature of problem

Thank you for purchasing a Pureheat™ Hydronic Air Heater. Both your Ground Heaters Distributor and Ground Heaters, Inc. want to assist you in every way possible to ensure your complete satisfaction with your purchase.

START UP, OPERATION AND SHUTDOWN

2.1 CIRCULATION SYSTEM ADVISORY

2.1.1 Standard Configuration Performance

2.1.1.1 HX200 Heat Xchangers™

A Pureheat™ Hydronic Air Heater equipped with HX200 Heat Xchangers™ should conform to the following system configurations:

- Connection of up to Four (4) HX200 Heat Xchangers™ utilizing any combination [50 ft (15 m), 100 ft (30 m) or 200 ft (61 m)] of Circulation Hoses. Maximum run should not exceed 200 ft (61 m) from base unit.
- The maximum vertical rise or drop from the Pureheat to each HX200 is 60 ft (18 m) one way from base unit.

2.1.1.2 HX200 Heat Xchangers™ with Optional Booster Pump

A Pureheat™ Hydronic Air Heater equipped with HX200 Heat Xchangers™, optional Booster Pump and Auxiliary Pump Panel should conform to the following system configurations:

- Connection of up to Four (4) HX200 Heat Xchangers™ utilizing any combination [50 ft (15 m), 100 ft (30 m) or 200 ft (61 m)] of Circulation Hoses with a maximum overall horizontal run not to exceed 400 ft (122 m) from base unit.
- The maximum vertical rise or drop from the Pureheat to each HX200 is 100 ft (30 m) one way from base unit.

2.1.1.3 HX100 Heat Xchangers™

A Pureheat™ Air Heater equipped with HX100 Heat Xchangers™ and 4-Port Remote Manifolds should conform to the following system configurations:

- Connect the Four (4) 4-Port Remote Manifolds utilizing any combination [50 ft (15 m) or 100 ft (30 m)] of Circulation Hoses with a maximum overall horizontal run not to exceed 150 ft (45 m) for each 4-Port Remote Manifold.
- The maximum vertical rise or drop from the Pureheat to each Xchanger™ or 4-Port Remote Manifold is 60 ft (18 m) one way from base unit.
 - Connect Two (2) HX100 Heat Xchangers™ to each of the Four (4) 4-Port Remote Manifolds utilizing the 40 ft (12 m) 5/8 in. ID Black Circulation Hoses mounted on the HX100 Heat Xchangers™.

2.1.1.4 HX100 Heat Xchangers™ with Booster Pump

A Pureheat™ Hydronic Air Heater equipped with the HX100 Heat Xchangers™, 4-Port Remote Manifolds, optional Booster Pump and Auxiliary Pump Panel should conform to the following system configurations:

- Connect the Four (4) 4-Port Remote Manifolds utilizing any combination [50 ft (15 m), 100 ft (30 m) or 200 ft (61 m)] of Circulation Hoses with a maximum overall horizontal run not to exceed 350 ft (106 m) for each 4-Port Remote Manifold.
- The maximum vertical rise or drop from the Pureheat to each Xchanger or 4-Port Remote Manifold is 100 ft (30 m) one way from base unit.
 - Connect Two (2) HX100 Heat Xchangers™ to each of the Four (4) 4-Port Remote Manifolds utilizing the 40 ft (12 m) 5/8 in. ID Black Circulation Hoses mounted on the HX100 Heat Xchangers™.

2.1.1.5 HX50 Heat Xchangers™

A Pureheat™ Hydronic Air Heater equipped with HX50 Heat Xchangers™ and 4-Port Remote Manifolds should conform to the following system configurations:

- Connect the Four (4) 4-Port Remote Manifolds utilizing any combination [50 ft (15 m) or 100 ft (30 m)] of Circulation Hoses with a maximum overall horizontal run not to exceed 150 ft (45 m) for each 4-Port Remote Manifold.
- The maximum vertical rise or drop from the Pureheat to each Xchanger™ or 4-Port Remote Manifolds is 60 ft one way from base unit.
 - Connect Four (4) HX50 Heat Xchangers™ to each of the Four (4) 4-Port Remote Manifolds utilizing the 40 ft (12 m) 1/2 in. ID Black Circulation Hoses mounted on the HX50 Heat Xchangers™.

2.1.1.6 HX50 Heat Xchangers™ with Booster Pump

A Pureheat™ Air Heater equipped with the HX50 Heat Xchangers™, 4-Port Remote Manifolds, optional Booster Pump and Auxiliary Pump Panel should conform to the following system configurations:

- Connect the Four (4) 4-Port Remote Manifolds utilizing any combination [50 ft (15 m), 100 ft (30 m) or 200 ft (61 m)] of Circulation Hoses with a maximum overall horizontal run not to exceed 350 ft (106 m) for each 4-Port Remote Manifold.
- The maximum vertical rise or drop from the Pureheat to each Xchanger™ or 4-Port Remote Manifold is 100 ft (30 m) one way from base unit.
 - Connect the Four (4) HX50 Heat Xchangers™ to each of the Four (4) 4-Port Remote Manifolds utilizing the 40 ft (12 m) 1/2 in. ID Black Circulation Hoses mounted on the HX50 Heat Xchangers™.

2.1.1.7 Maximum Heat Xchanger™ Connection Capability

Connecting the maximum number of Heat Xchangers™ will not increase the heat delivered to the space (compared to above stated standard configurations) but will provide increased air circulation.

All Pureheat™ Hydronic Air Heaters are equipped with a 5-Port On-Board Manifold (Circulation Hoses connection points) capable of a maximum connection of five (5) HX200 Heat Xchangers™, ten (10) HX100 Heat Xchangers™ with Five (5) 4-Port Remote Manifolds, and twenty (20) HX50 Heat Xchangers™ with Five (5) 4-Port Remote Manifolds.

2.1.2 Optional Booster Pump

All Pureheat™ Hydronic Air Heaters are equipped to accept an optional Booster Pump which requires the use of an Auxiliary Pump Panel for electrical connection to provide safety shutdown of the optional Booster Pump. (For setup instructions, refer to Section 2.8, CONNECTING/DISCONNECTING OPTIONAL BOOSTER PUMP.)

2.1.3 Circulation Hose Limitations

Do not create excessively long Circulation Hoses by connecting multiple (more than two) Circulation Hoses in series. Multiple QCs cause a loss of working pressure and restrict flow.

- Regardless of length, no more than two (2) Supply Circulation Hoses should be connected in series;
- Regardless of length, no more than two (2) Return Circulation Hoses should be connected in series;
- Overall Supply and Return Circulation Hoses should be no more than a combined 400 ft (122 m) in length (with Main Pump);
- Overall Supply and Return Circulation Hoses should be no more than a combined 800 ft (244 m) in length (with optional Booster Pump);

2.1.4 Insulate Circulation Hoses

Any Circulation Hoses exposed to the outdoor elements should be insulated for maximum heat delivery into work space. Ground Heaters, Inc. recommends wrapping a cut-to-size Red Wave™ Blanket around exposed Circulation Hoses. Secure the wrapped blankets to minimize air infiltration and heat loss.

Contact your local Ground Heaters Distributor for additional system configuration advice.

2.1.5 Circulation Hose Protection

Do not drive any vehicles or equipment over the Circulation Hoses. If the Hoses must be deployed in high traffic areas, construct ramps or guards to protect from damage.



HTF may discolor floor surface. Provide extra protection and care to circulation hoses when floor appearance is critical. Place hoses away from high traffic areas whenever possible.

2.2 PRE-START UP CHECKS

2.2.1 Positioning

1. Position the Pureheat's 5-Port On-Board Manifold as close as possible to the space to be heated. Circulation Hoses can then easily enter and exit the structure.



The Pureheat must be positioned a minimum of 12 ft (3.6 m) from fuel source or combustible materials.

2. Chock the wheels to prevent accidental rolling.
3. Use the Heavy Duty Jack-Stand to position the machine as level as possible.

2.2.2 Unloading HX200 Heat Xchangers™

1. OPEN the Rear Doors and remove the aluminum Ramp from its storage location above Xchangers™.
2. Position the Ramp onto the Ramp Alignment Pins to unload either the left side or the right side HX200s. (Photo 2-1)

NOTE: Each HX200 Heat Xchanger™ is equipped with wheels and fold-out handles.

3. Position the HX200s inside the building per your heating plan. (Refer to Appendix C-1, Pureheat APPLICATION LAYOUTS.)

NOTE: Each HX200 Heat Xchanger™ must be connected to a separate 15 amp. 120 volts AC 60 Hz electrical circuit. Use 12-3 extension cords of no more than 100 ft (30 m) in length.



4. Momentarily turn the BLOWER Switch ON to test Blower operation then turn the BLOWER Switch OFF.

2.2.3 Unloading HX100 Heat Xchangers™

1. OPEN the Rear Doors and remove the aluminum Ramp from the storage location above Xchangers.
2. Position the Ramp onto the Ramp Alignment Pins to unload either the left side, right side or the middle section HX100s. (Photo 2-2)

NOTE: Each HX100 Heat Xchanger™ is equipped with wheels, Lifting Bail and Lift-Up Handle.

3. Position the HX100s inside the building per your heating plan. (Refer to Appendix C-1, PUREHEAT APPLICATION LAYOUTS.)

NOTE: Each HX100 Heat Xchanger™ must be connected to a separate 15 amp. 120 volts AC 60 Hz electrical circuit. Use 12-3 gauge extension cords of no more than 100 ft (30 m) in length.



4. Momentarily turn the Fan Switch ON to test Fan operation then turn the Fan Switch OFF.

2.2.4 Unloading HX50 Heat Xchangers™

1. OPEN the Rear Doors and unload the HX50s. (Photo 2-3)

NOTE: Each HX50 Heat Xchanger™ is equipped with a Lifting Bail and Handles. The HX50 Heat Xchangers™ weigh approximately 70 lbs and can be lifted by one individual.

2. Position the HX50s inside the building per your heating plan. (Refer to Appendix C-1, PUREHEAT APPLICATION LAYOUTS.)

NOTE: Each HX50 Heat Xchanger™ must be connected to a separate 15 amp. 120 volts AC 60 Hz electrical circuit. Use 12-3 gauge extension cords of no more than 100 ft (30 m) in length.



3. Momentarily turn the Fan Switch ON to test Fan operation then turn the Fan Switch OFF.

2.2.5 Heat Transfer Fluid (HTF)

OPEN the Side Doors and Latch them to the Door Tiebacks

1. Verify Heat Transfer Fluid (HTF) level is between MIN and MAX lines on the Sight Gauge Decal located on expansion tank above Hydronic Heater. (Photo 2-4) If fluid level is not above MIN level, refer to Section 4.1, ADDING HEAT TRANSFER FLUID, to correct before attempting to start the Burner or HTF Pump.



If HTF temperatures are below -15°F (-26°C), pre-heat the HTF and Pump housing before turning the Pump ON.

2.2.6 Switch Positions

(Refer to Appendix A-2.)

Verify the MAIN BREAKER 1, MAIN BREAKER 2, PUMP, BURNER, CAB LIGHT and HOSE REWIND Switches are in the OFF position on the Main Control Panel.



2.2.7 Deployment of Circulation Hoses or Option Heat Transfer Hose
(Applies to Pureheat and Hose Handling Systems HHS3004)

The Hose Reel contains Ten (10) 1 in. ID Red Circulation Hoses with QCs [Four (4) at 50 ft (15 m), Four (4) at 100 ft (30 m), and Two (2) at 200 ft (61 m)].

1. Release the Hose Reel Brake by turning the Brake T-handle counterclockwise
2. Remove the 1 in. ID Red Circulation Hoses with QCs or 5/8 in. ID Black Heat Transfer Hose Loops (HHS3004) from the Hose Reel. Disconnect each hose Quick-Connect as it is removed from the Hose Reel.
3. Select the shortest 1 in. ID Red Circulation Hoses and route, one at a time, to provide a supply and return connection to each Heat Xchanger™ or 4-Port Remote Manifold (if applicable) and 5-Port On-Board Manifold.
4. Connect Circulation Hoses to the respective Heat Xchanger™ or 4-Port Remote Manifold (if applicable) Supply and Return connections. Support the QC on the HX200 Xchanger™ with one hand when making these connections to insure good connection. Ensure hoses lay on top of HX200 Heat Xchanger™ once connection is made to avoid HTF restrictions.
5. The HX50 and the HX100 series Heat Xchangers™ are equipped with 40 ft (12 m) of ½ in or 5/8 in. ID Black Circulation Hoses permanently mounted and will connect to the 4-Port Remote Manifolds. Four (4) HX50 or Two (2) HX100 can be connected per 4-Port Remote Manifold).

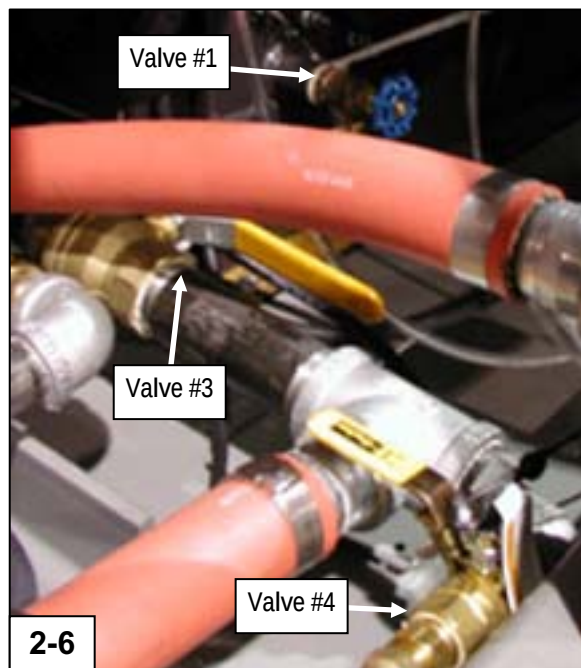
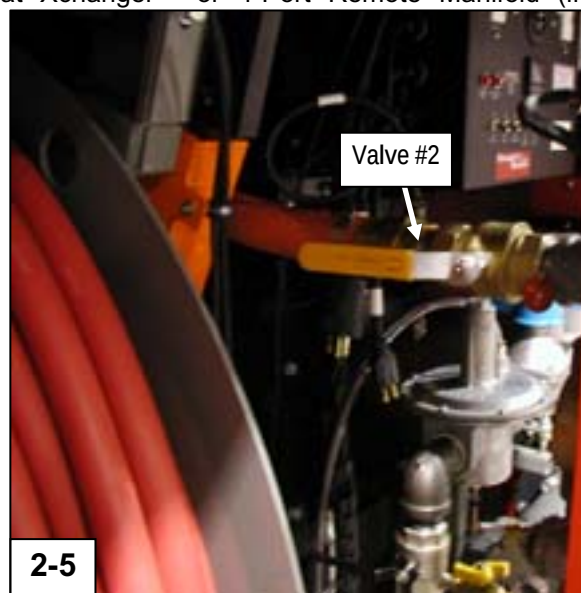
2.3 INITIAL POWER UP

1. Connect the Main Control Panel Pigtail marked MAIN POWER 1 to an extension cord connected to one 15 amp 120 volts AC 60 Hz electrical power circuit. Connect the Main Control Panel Pigtail marked MAIN POWER 2 Twist-Lock Male cord end to a Twist-Lock Female cord end extension cord connected to one 20 amp 120 volts AC 60 Hz electrical power circuit. Use only heavy-duty 10-3 extension cords of no more than 100 ft (30 m) in length.
2. Turn the MAIN BREAKER 1 and MAIN BREAKER 2 Switches ON, verify the following:
 - a. LINE 1 and 2 GFI's remain reset and Amber Indicator Lights are OFF.
 - b. LOW LEVEL FAULT light is ON for fifteen seconds and then turns OFF.
 - c. Temperature Control (TC) displays HTF temperature in red and desired temperature (set point) in green numbers.

2.4 START UP

2.4.1 Integrity Check

Verify all hose, fittings, and pipe connections are not leaking.



2.4.2 Warming the Heat Transfer Fluid

1. Use the UP/DOWN arrow keys to adjust the temperature set-point on the TC to 70°F (21°C). (Refer to Appendixes A-2 and A-3.)
2. Turn the BURNER Switch ON, then verify the following:
 - a. The Burner Motor starts (after a five second delay) and fires fifteen seconds later. If the Burner fails to start, refer to Appendixes A-12 and A-13.
 - b. The Burner runs clean, quiet and with no visible smoke. If the Burner operation is in question, a qualified service technician should check Burner settings and emissions.

NOTE: Section 4.3, BURNER COMBUSTION VERIFICATION AND ADJUSTMENT, provides detailed instructions for testing Burner emissions and settings.

2.4.3 Initiating Flow through Heat Transfer Hose

(Refer to Appendix B-1.)

1. Position the following valves as directed below:
 - a. OPEN the Suction Valve #3. (Photo 2-6)
 - b. Verify Cross-Connect Valve #5 is OPEN. (Photo 2-13)
 - c. Verify Return Valve #2 is fully CLOSED. (Photo 2-5)
2. Turn the PUMP Switch ON at the Main Control Panel until the Pump Motor has reached full RPM. The Dashboard Pressure Gauge will read an approximate 50 psig. Slowly OPEN Return Valve #2, lowering operating pressure, to a minimum of 30 psig on the Dashboard Pressure Gauge for optimum flow rate. (Photo 2-8)



If ambient temperatures are below -15°F (-26°C), you must pre-heat the Pump before turning the Pump ON.

3. Turn each Heat Xchanger™ BLOWER or FAN Switch ON and verify the thermostat is at the desired set point temperature. Output air temperature will increase as the system warms up.

NOTE: Blowers will not run if the Heat Xchanger™ thermostats are set too low.



4. Periodically verify proper system operation using the dashboard gauges. Adjust Return Valve #2 so that the Dashboard Pressure Gauge maintains 30 psig. Min. The Return Flow Indicator should spin. The HTF return temperature should read approximately 40° to 50°F (22° to 28°C) less than the supply temperature (red numbers on the Main Control Panel). (Photo 2-7 and 2-8)

5. Set the TC to temperature required for application.

NOTE: Always set the TC to 180°F (82°C) for thawing, frost prevention and air heating applications. Concrete curing applications usually require temperature settings below 180°F (82°C).



2.5 OPERATING WITH OPTIONAL ACCESSORIES

The Pureheat has the capability to operate with up to Twenty (20) 750 ft (228 m) Accessory Hose Loops using One (1) Booster Pump, Five (5) Hose Handling Systems 3004 (HHS3004), Five (5) 4-Port Remote Manifolds and One (1) Auxiliary Pump Panel.

2.5.1 Using Three HHS3004 with Booster Pump for Thawing Applications (Refer to Appendix B-6.)

Thawing applications require the use of Three (3) HHS3004s with Twelve (12) 750 ft (228 m) Accessory Hose Loops of 5/8 in. ID Heat Transfer Hose (HTH), One (1) optional Booster Pump, Three (3) 4-Port Remote Manifolds and One (1) Auxiliary Pump Panel.

1. Install the optional Booster Pump and Auxiliary Pump Panel as directed in Section 2.8, CONNECTING/DISCONNECTING OPTIONAL BOOSTER PUMP.
2. Place the Three (3) HHS3004s and Three (3) 4-Port Remote Manifolds spaced appropriately on the jobsite for thawing application.
3. Connect the Three (3) 4-Port Remote Manifolds to the 5-Port On-Board Manifold as directed in Step 2.2.7, Deployment of Circulation Hoses.
4. Connect the Accessory Hose Loop 1 Female QC to one of the available 4-Port Remote Manifold Discharge Male QCs.
5. Remove the Accessory Hose Loop 1 from the HHS3004 Reel and place at job site for thawing application. The QCs joining Accessory Hose Loop 1 and Accessory Hose Loop 2 will be exposed when nearing the end of Accessory Hose Loop 1.
6. Once the QCs have been exposed, separate Accessory Hose Loop 1 and Accessory Hose Loop 2. Connect the Accessory Hose Loop 1 Male QC to one of the available 4-Port Remote Manifold Return Female QCs.
7. Connect the Accessory Hose Loop 2 Female QC to one of the remaining 4-Port Remote Manifold Discharge Male QCs.
8. Remove the Accessory Hose Loop 2 from the HHS Reel and place at job site for thawing application. The QCs joining Accessory Hose Loop 2 and Accessory Hose Loop 3 will be exposed when nearing the end of Accessory Hose Loop 2.
9. Once the QCs have been exposed, separate Accessory Hose Loop 2 and Accessory Hose Loop 3 QCs. Connect the Accessory Hose Loop 2 Male QC to one of the available 4-Port Remote Manifold Return Female QCs.
10. Repeat Step 4 through Step 9 for the remaining Accessory Hose Loop 3 and Accessory Hose Loop 4 of the HHS3004.
11. Repeat Step 4 through Step 10 for the remaining Two (2) HHS3004s.
12. Power up the Main Control Panel as directed in Section 2.3, INITIAL POWER UP and start the optional Booster Pump after starting the Main Pump.



The Booster Pump must be connected to the Auxiliary Pump Panel to maintain low HTF level protection. Operating the Booster Pump without low HTF level protection could lead to complete loss of system HTF and HTF Pump failure.

2.5.2 Using Five HHS3004 with Booster Pump for Curing and Frost Prevention Applications (Refer to Appendix B-7 and B-8.)

Curing and Frost Prevention applications require the use of Five (5) HHS3004 with Twenty (20) 750 ft (228 m) Accessory Hose Loops of 5/8 in. ID Heat Transfer Hose (HTH), One (1) optional Booster Pump, Five (5) 4-Port Remote Manifolds and One (1) Auxiliary Pump Panel.

1. Install the optional Booster Pump and Auxiliary Pump Panel as directed in Section 2.8, CONNECTING/DISCONNECTING OPTIONAL BOOSTER PUMP.

2. Place the Five (5) HHS3004 and Five (5) 4-Port Remote Manifolds spaced appropriately on the jobsite for thawing application.
3. Connect the five (5) 4-Port Remote Manifolds to the 5-Port On-Board Manifold as directed in Step 2.2.7, Deployment of Circulation Hoses.
4. Connect the Accessory Hose Loop 1 Female QC to one of the available 4-Port Remote Manifold Discharge Male QCs.
5. Remove the Accessory Hose Loop 1 from the HHS3004 Reel and place at job site for thawing application. The QCs joining Accessory Hose Loop 1 and Accessory Hose Loop 2 will be exposed when nearing the end of Accessory Hose Loop 1.
6. Once the QCs have been exposed, separate Accessory Hose Loop 1 and Accessory Hose Loop 2. Connect the Accessory Hose Loop 1 Male QC to one of the available 4-Port Remote Manifold Return Female QCs.
7. Connect the Accessory Hose Loop 2 Female QC to one of the remaining 4-Port Remote Manifold Discharge Male QCs.
8. Remove the Accessory Hose Loop 2 from the HHS Reel and place at job site for thawing application. The QCs joining Accessory Hose Loop 2 and Accessory Hose Loop 3 will be exposed when nearing the end of Accessory Hose Loop 2.
9. Once the QCs have been exposed, separate Accessory Hose Loop 2 and Accessory Hose Loop 3. Connect the Accessory Hose Loop 2 Male QC to one of the available 4-Port Remote Manifold Return Female QCs.
10. Repeat Step 4 through Step 9 for the remaining Accessory Hose Loop 3 and Accessory Hose Loop 4 of the HHS3004.
11. Repeat Step 4 through Step 10 for the remaining Four (4) HHS3004s.
12. Power up the Main Control Panel as directed in Section 2.3, INITIAL POWER UP and start the optional Booster Pump after starting the Main Pump in Step 2.4.3.



The Booster Pump must be connected to the Auxiliary Pump Panel to maintain low HTF level protection. Operating the Booster Pump without low HTF level protection could lead to complete loss of system HTF and HTF Pump failure.

2.6 MONITORING OPERATING PARAMETERS

The following parameters should be monitored regularly:

1. Fuel Tank Level: Keep track of fuel consumption to plan refueling schedule.
2. HTF Level: Should remain between MIN and MAX lines on the HTF Sight Gauge Decal. (Photo 2-6)
3. HTF Return Temperature(s): During a thaw application, the return temperatures will drop close to the surface temperature before rising rapidly to approximately 100°F (38°C). Return temperatures will rise slowly to an approximate 140°F (60°C), as the thaw nears completion. During curing applications, the return temperatures should average 5° to 20°F (3° to 11°C) above the concrete surface temperature. During a frost prevention application, the return temperatures will drop close to the surface temperature before rising rapidly to approximately 140°F (60°C). During air heating applications, the return temperatures should be approximately 40°F (22°C) below the supply temperature.
4. HTF Supply Pressure: During air heat, thawing, curing and frost prevention applications, the operating supply pressures should be 30 to 50 psig (207 kPa to 345 kPa).
5. Plumbing and Fitting Leaks: Always check for leaks during each monitoring period.

2.7 UNIT SHUTDOWN

2.7.1 Burner Shutdown

1. Turn the BURNER Switch OFF and allow system cool down.
2. Continue running the Main Pump and optional Booster Pump (if applicable) for 15 to 20 minutes to cool the HTF to 120°F (49°C) or lower.
3. Turn the Main PUMP and BOOSTER PUMP (if applicable) Switch OFF.
4. SHUT the Return Valve #2 and Suction Valve #3.
5. SHUT the Cam-Lock Suction Valve #6 and Cam-Lock Return Valve #7 and Open Cross-Connect Valve #5 (if applicable).

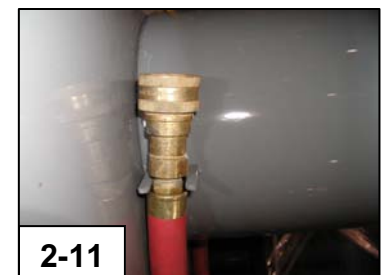


2.7.2 Disconnecting Hoses from Heat Xchangers™ and Pureheat

1. Disconnect the Supply and Return Hose Sets from the 5-Port On-Board Manifold and the Heat Xchangers™ or 4-Port Remote Manifold (if applicable).
2. HX50 and HX100 series 1/2 in. ID X 40 ft. Black Hose Assemblies with QCs wind onto the back of the Heat Xchanger™. (Photo 2-9)

2.7.3 Rewinding the Circulation Hose

1. Fully release Hose Reel Brake (Photo 2-10) by turning the Brake T-handle counterclockwise. Attach the female end of 200 ft Circulation Hose to the Hose Reel Rewinding Hook (Photo 2-11). Rewind the longest hose lengths first.
2. Turn ON the HOSE REWIND Switch.
3. Rinse QC in a bucket of water to remove any dirt before connecting onto hose reel. (Refer to Appendix B-11 PUREHEAT SAFETY CONTROLS QUICK CONNECT AND CAM-LOCK CARE AND MAINTENANCE.
4. Remove the Foot Pedal from storage location and position to allow control of rewind operation. The Foot Pedal should be placed on a piece of plywood or other material to keep it dry.
5. Turn the REWIND MOTOR Switch ON at the Main Control Panel.

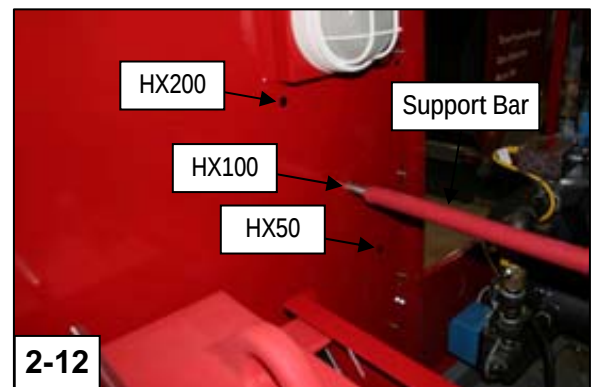


Always wear gloves to protect hands while rewinding circulation hoses.

6. Depress the Foot Pedal to begin rewinding, and guide the hose evenly onto the Hose Reel.
7. Sequentially connect additional 1 in. ID Red Hose Assemblies with QC's (200 ft, 100 ft and 50 ft).



Rewind the final 10 ft (3 m) of each 1 in. ID Circulation Hose by hand to prevent damaging a fitting or hose connection.



8. Set the Hose Reel Brake by turning the Brake T-handle clockwise when all of the Supply and Return Hose Sets have been rewound on the Hose Reel and turn the HOSE REWIND Switch OFF.

9. Return Foot Pedal to storage location.

2.7.4 Completing Unit Shutdown

1. Retrieve and reload the Heat Xchangers™ into the trailer. Stow ramp, latch and lock the Rear Doors to secure Heat Xchangers™.

NOTE: If loading a different series of Heat Xchangers™ into the P 1260, refer to Photo 2-12 for proper positioning of the Heat Xchanger™ Storage Area Cross-Support Bar.

2. Disconnect the optional Booster Pump and Auxiliary Pump Panel as directed in Step 2.8.4.
3. Disconnect fuel supply line(s). NG or LP disconnection requires a qualified technician.
4. Turn the CAB LIGHT, HOSE REWIND, PUMP, BURNER, HTF FILL, MAIN BREAKER 1 and MAIN BREAKER 2 Switches OFF.
5. Disconnect and remove the power cords; Latch and Lock all remaining Doors.

2.8 CONNECTING/DISCONNECTING OPTIONAL BOOSTER PUMP

(Refer to Appendix A-15 and B-2.)

2.8.1 Connecting

1. Install / connect Auxiliary Pump Panel to the Main Control Panel (Refer to Appendix A-15 and B-2).

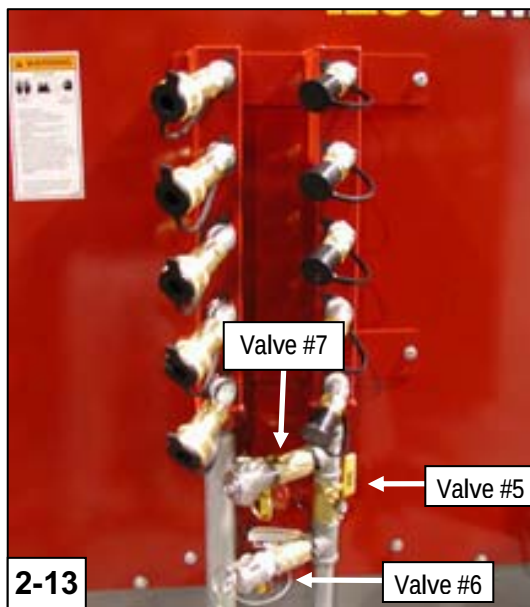
NOTE: The Auxiliary Pump Panel ensures that the optional Booster Pump will shutdown if a LOW LEVEL FAULT condition exists.

2. Place the optional Booster Pump within 6 ft (2 m) of the 5-Port On-Board Manifold.
3. Remove the Suction Cam-Lock Leader Hose, Return Cam-Lock Leader Hose and the Power Cord stowed in the interior of the Booster Pump enclosure.
4. Ensure that Suction Valve #6 and Return Valve #7 are SHUT and LOCKED. (Photo 2-13)
5. Ensure the Auxiliary Pump Panel BREAKER Switch is OFF.
6. Ensure the Main PUMP Switch is OFF at the Main Control Panel.
7. Remove the Protective Caps from the 5-Port On-Board Manifold and remove the Cam-Lock Protective Caps of the Cam-Lock Suction Valve #6 and the Cam-Lock Return Valve #7.
8. Connect the Booster Pump Suction Cam-Lock Leader Hose to the Cam-Lock Suction Valve #6 Cam-Lock and connect the optional Booster Pump Return Cam-Lock Leader Hose to the Cam-Lock Return Valve #7.



DO NOT CONNECT THE OPTIONAL BOOSTER PUMP SUCTION LEADER HOSE AND RETURN LEADER HOSE WITH THE MAIN PUMP ON. VERIFY SYSTEM PRESSURE IS AT ZERO (0) PSIG. PRIOR TO CONNECTION.

9. UNLOCK and OPEN Suction Valve #6 and Return Valve #7. Shut the Cross-Connect Valve #5. (Photo 2-13)
10. Plug the Booster Pump power cord into the Auxiliary Pump Panel Female Pigtail.



11. Connect a heavy duty 10-3 extension cord of no more than 20 ft (6 m) in length into the Auxiliary Pump Panel Male Pigtail.
12. Connect a 20 amp. 120 volts AC 60 Hz electrical circuit supply (not the same circuit used for the Pureheat) to the Auxiliary Pump Panel.

NOTE: The Booster Pump should only be started after the Pureheat has been set up and is ready for use. The Booster Pump will only operate when the Main PUMP Switch is turned ON at the Main Control Panel. (Refer to Section 2.4, START UP.)

2.8.2 Start Up

1. Verify Cam-Lock Suction Valve #6 and Cam-Lock Return Valve #7 are in the OPEN position. Verify Cross-Connect Valve #5 is in the SHUT position. (Photo 2-13).
2. Turn the BURNER Switch ON at the Main Control Panel.
3. Turn the Main PUMP Switch ON at the Main Control Panel.
4. Turn the Auxiliary Pump Panel BREAKER Switch ON.

2.8.3. Shutdown

1. Turn the BURNER Switch OFF.
2. Continue to operate the Main Pump and optional Booster Pump until the HTF has cooled below 120°F (49°C).
3. Turn the Main PUMP Switch OFF at the Main Control Panel.
4. Turn the Auxiliary Pump Panel BREAKER Switch OFF.
5. SHUT and LOCK Cam-Lock Suction Valve #6 and Cam-Lock Return Valve #7 and replace the Cam-Lock Protective Caps. OPEN Cross-Connect Valve #5. (Photo 2-13)



DO NOT DISCONNECT THE OPTIONAL BOOSTER PUMP SUCTION LEADER HOSE AND RETURN LEADER HOSE UNTIL HTF HAS SUFFICIENTLY COOLED AND SYSTEM PRESSURE IS AT ZERO (0) PSIG.

2.8.4 Disconnecting

1. Disconnect the optional Booster Pump Suction Cam-Lock Leader Hose from the Cam-Lock Suction Valve #6 and connect the Protective Cap at the 5-Port On-Board Manifold.
2. Disconnect the optional Booster Pump Return Cam-Lock Leader Hose from the Cam-Lock Return Valve #7 and connect the Protective Cap at the 5-Port On-Board Manifold.
3. Connect the Protective Cap on the optional Booster Pump Suction Cam-Lock Leader Hose and Return Cam-Lock Leader Hose.
4. Disconnect the Booster Pump Power Cord and extension cord. Stow the Booster Pump Power Cord, Suction Cam-Lock Leader Hose and Return Cam-Lock Leader Hose neatly in the Booster Pump enclosure.



Verify that Drain Valve #1, Return Valve #2, and Suction Valve #3 are SHUT. Fill Valve #4, Cam-Lock Suction Valve #6 and Cam-Lock Return Valve #7 must locked SHUT. Cross-Connect Valve #5 is OPEN. Verify that the Male and Female Cam-Lock fittings on Cam-Lock Suction Valve #6 and Cam-Lock Return Valve #7 are plugged and capped. (Refer to Photos 2-7, 2-8 and 2-13)

BURNER ADJUSTMENT AND SHUTDOWN

The Pureheat™ Hydronic Air Heater can be operated on natural gas (NG), liquid propane vapor (LP) or diesel/fuel oil (OIL). (Refer to Appendix A-24 or A-25 for Burner component identification)

NOTE: All Burners on Pureheat™ are initially calibrated (adjusted) by test firing at Ground Heaters, Inc.'s factory located 600 ft (180 m) above sea level (asl) using NG/LP or a 70/30 blend of #2 and #1 (K1) diesel along with additives.

For NG and LP Burners: The air and/or gas settings are returned to “zero” after factory test firing. A CERTIFIED AND LICENSED GAS TECHNICIAN MUST RECALIBRATE THE BURNER AIR AND FUEL SETTINGS TO OBTAIN PROPER COMBUSTION AT YOUR WORK SITE.

1. Burner setup and installation, fuel supply connection, test-firing and Burner adjustment must be performed by a licensed professional and must conform to the requirements of local, state and federal authorities. In the Commonwealth of Massachusetts, gas piping shall be installed by a licensed plumber or gas fitter.
2. All gas and propane connections must be leak tested prior to placing into service.
3. The Pureheat™ must not be installed within 12 ft (3.6 m) of combustible materials.
4. All NG/LP Burners are test fired at Ground Heaters, Inc.'s factory prior to shipment.

To ensure proper Burner performance and to avoid machine downtime due to heater sooting, Burner combustion verification and adjustment must be performed:

- before starting at a new job site
- before operating at elevations 1,000 ft (305 m) above or below the last adjustment
- after any Burner maintenance has been performed
- after changing fuel from NG to LP or LP to NG
- after removing oil Burner and installing gas Burner
- after removing gas Burner and installing oil Burner
- if Burner performance is in question for any reason

A Combustion Analyzer, Smoke True Spot Tester, Fuel Pressure Test Kit (oil), Low and High range Manometers (NG/LP) and common hand tools will be required.

3.1 NATURAL GAS/LIQUID PROPANE

3.1.1 Burner Adjustment

Before beginning these steps, it is assumed that the NG/LP Burner and gas train have been installed per Section 4.2.2.

NOTE: The use of a high quality combustion analyzer and two manometers, one with a range of 0 to 15 in. water column [WC] and one with a range of 0 to 30 in. WC is mandatory. All adjustments must be accomplished by a licensed professional and must conform to the requirements of local, state and federal codes and authorities.

Use air damper settings and fuel pressure adjustments to obtain an Exhaust O₂ value of 3 to 5% and a smoke spot value of 1 or less. Maintaining O₂ in the 3 to 5% range assures that there are no unburned hydrocarbons remaining in the exhaust. Unburned hydrocarbons cause soot production.

If the above values cannot be obtained by adjusting the Burner air dampers alone, it may be necessary to reduce the firing rate (lower fuel pressure). This is especially true at elevations above 3,000 ft (914 m).

3.1.1.1 Fuel Pressure Adjustment

1. Ensure that the fuel supply source is OFF.
2. Ensure that the Main Gas Supply Ball Valve is SHUT.
3. Remove the ¼ in. pressure tap plug located in the gas train inlet ball valve body (opposite of the pilot gas cock).
4. Install a ¼ in. petcock and pipe adapter in the location of the pipe plug to facilitate connecting the 0 to 30 in. WC Manometer. Ensure the petcock is SHUT. Do not use pipe dope on this joint.
5. Remove the ¼ in. pressure tap plug located at the end of the “T” fitting just below the gas train union.
6. Install an adapter in the location of the pipe plug to facilitate connecting the 0 to 15 in. WC Manometer for manifold pressure adjustment. Ensure the petcock is SHUT. Do not use pipe dope on this joint.
7. Loosen the air dampers locking screws enough to provide movement for adjustment. Open the top damper 45% and fully shut the bottom damper. (Refer to Appendix A-24)
8. Turn on the main gas supply.
9. Crack open the installed petcock of the supply line slowly while continuously monitoring gas pressure. Immediately shut the petcock if the gas pressure climbs past 14 in. WC. Contact your fuel supplier for gas pressure adjustment of no more than 12 to 14 in. WC before proceeding with further adjustment.
10. Once a maximum gas supply pressure of 12 to 14 in. WC has been verified; open the Main Gas Supply Ball Valve.
11. Remove the protective cap from the Manifold Gas Pressure Regulator to access the regulator adjusting stem.
12. Using a screwdriver, adjust the Manifold Gas Pressure Regulator stem until it is no more than ¼ in. below the threaded opening if using LP or no more than ½ in. below the threaded opening if using NG. This will avoid over-firing upon initial start up.
13. Open the gas manifold valve.
14. Turn MAIN BREAKER 1 and MAIN BREAKER 2 Switches ON. Allow a 15 second time delay for the low heat transfer fluid (HTF) system to recycle and clear.
15. Ensure that the digital temperature control's green numbers (temperature set-point) are at least 10° to 20°F (5° to 11°C) degrees higher than the red numbers (actual HTF temperature).
16. Turn the BURNER Switch ON.
17. After a 15 second pre-purge, the Burner will begin the ignition sequence; the pilot gas valve will open followed 15 seconds later by the main gas valves (MGV's).
18. Once the MGV's open, monitor the manometer connected to the manifold pressure tap and adjust the manifold regulator stem until the following values are obtained: 1.6 to 2.0 in. WC (LP);
2.5 to 3.0 in. WC (NG).

NOTE: Turn the manifold regulator stem clockwise to increase manifold pressure; turn the stem counterclockwise to reduce the manifold pressure.

19. Once the appropriate fuel pressure is set, proceed with air setting and adjustment.

3.1.1.2 Air Setting and Adjustment

Top or bottom air dampers may be opened or closed in amounts sufficient to adjust exhaust O₂ levels to 3 to 5% using a combustion analyzer.

3.1.1.3 O₂ Content Sampling

1. Follow the combustion analyzer manufacturer's instructions for pre-purge and exhaust sampling.
2. Sample the exhaust gas by inserting the combustion analyzer sampling probe into the chimney access hole provided through the exhaust guard. The probe must be greater than 5 in. (127 mm) in length for an accurate sampling. Exhaust O₂ content must be 3 to 4% for optimum performance and minimum soot production.
3. Several samples should be taken as the heater warms. The final sample should be taken just before the heater reaches 180°F (82.2°C).

3.1.1.4 Smoke Spot Sampling

1. Follow the smoke spot tester manufacturer's instructions for accurate exhaust sampling.
2. Start the Burner by turning the BURNER Switch ON. The Burner will start and begin a 45 second pre-purge followed by the ignition sequence
3. Sample the Burner exhaust for smoke by inserting the smoke spot sampling probe into the chimney access hole provided through the exhaust guard. The probe must be greater than 5 in. (127 mm) in length for an accurate sampling. Smoke spot production must be 2 or less.
4. Several samples should be taken as the heater warms. The final sample should be taken just before the heater reaches 180°F (82.2°C).

NOTE: Higher O₂ percentage (excess air settings) lowers soot production but raises stack temperature and reduces efficiency. Lower O₂ percentage (inadequate air settings) increases efficiency and lowers stack temperature but may cause soot build-up. A Burner optimized for clean and efficient operation will have O₂ levels of 3 to 4% and a smoke spot value of 1 or less.

5. Loosen the air dampers locking screws enough to provide movement for adjustment. Open the top damper 45%, and fully shut the bottom damper. (Refer to Appendix A-24)
- 6.. Adjust the air dampers until combustion parameters fall within the above outlined values.
7. Lock the air dampers in place by tightening the locking screws.

3.1.2 Burner Shutdown

1. Shut down the Burner by turning the BURNER Switch OFF.
2. Turn MAIN BREAKER 1 and MAIN BREAKER 2 Switches OFF.
3. Shut the Main Gas Supply Ball Valve. Remove the manometers, petcocks and adapters, and reinstall pipe plugs (use pipe dope).

NOTE: Should the Burner fail to respond during any of the air adjustments or if the fuel pressure cannot be adjusted or drifts, discontinue Burner setup and contact your Pureheat™ Distributor.

3.2 DIESEL/FUEL OIL

3.2.1 Burner Adjustment

Before beginning these steps, it is assumed that the optional diesel Burner has been installed per Section 4.2.1.

NOTE: The use of a high quality combustion analyzer and fuel pressure test gauge is mandatory. All adjustments must be accomplished by an experienced fuel oil Burner professional and must conform to the requirements of local, state and federal codes and authorities.

Use air band and shutter settings and fuel pressure adjustments to obtain an Exhaust O₂ value of 3 to 4% and a smoke spot value of 1 or less. Maintaining O₂ in the 3 to 4% range assures that there are no unburned hydrocarbons remaining in the exhaust. Unburned hydrocarbons cause soot production. If the above values cannot be obtained by adjusting the Burner air band and shutters alone, it may be necessary to reduce the firing rate (lower fuel pressure and/or install a smaller nozzle). This is especially true at elevations above 3,000 ft (914 m).

3.2.1.1. Fuel Pressure Adjustment

1. Disconnect the fuel Quick-Connects.
2. Remove the ¼ in. pressure tap plug located on the top of the Burner fuel pump.
3. Install an adapter to facilitate using a 0 to 300 psi pressure test gauge. Do not use pipe dope.
4. Connect the fuel Quick-Connects.
5. Turn the BURNER Switch ON.
6. The Burner will begin a 15 second pre-purge. Monitor the fuel pressure during the pre-purge and make adjustments using the fuel pressure adjusting screw. (Refer to Appendix A-26)
7. Turn the adjusting screw clockwise to increase fuel pressure or counter clockwise to decrease fuel pressure until it is stable at 150 psig.
8. Once the fuel pressure is set, proceed with air setting and adjustment.

3.2.1.2 Air Setting and Adjustment

Air Band and Shutter may be opened or closed in amounts sufficient to adjust exhaust O₂ levels as sampled using a combustion analyzer. (Refer to Appendix A-26)

3.2.1.3 O₂ Content Sampling

1. Follow the combustion analyzer manufacturer's instructions for pre-purge and exhaust sampling.
2. Sample the exhaust gas by inserting the combustion analyzer sampling probe into the chimney access hole provided through the exhaust guard. The probe must be greater than 5 in. (127 mm) in length for an accurate sampling. Exhaust O₂ content must be 3 to 4% for optimum performance and minimum soot production.
3. Several samples should be taken as the heater warms. The final sample should be taken just before the heater reaches 180°F (82.2°C).

3.2.1.4 Smoke Spot Sampling

1. Follow the smoke spot tester manufacturer's instructions for accurate exhaust sampling.
2. Sample the Burner exhaust for smoke by inserting the smoke spot sampling probe into the chimney access hole provided through the exhaust guard. The probe must be greater than 5 in. (127 mm) in length for an accurate sampling. Smoke spot production must be 2 or less.
3. Several samples should be taken as the heater warms. The final sample should be taken just before the heater reaches 180°F (82.2°C).

NOTE: Higher O₂ percentage (excess air settings) lowers soot production but raises stack temperature and reduces efficiency. Lower O₂ percentage (inadequate air settings) increases efficiency and lowers stack temperature but may cause soot build-up. A Burner optimized for clean and efficient operation will have O₂ levels of 3 to 4% and a smoke spot value of 1 or less.

4. Loosen the air band and shutter locking screws enough to provide movement for adjustment. (Refer to Appendix A-26)
5. Start the Burner by turning the BURNER Switch ON. The Burner will start and begin a 15 second pre-purge followed by the ignition sequence.

6. Once the Burner lights, sample the exhaust. Adjust the air band and shutter until combustion parameters fall within the above outlined values.
7. Lock the air band and shutter in place by tightening the locking screws.



Do not exceed 150 psi fuel pressure

Do not set below 125 psi fuel pressure

3.2.2 Burner Shutdown

1. Shut down the Burner by turning the BURNER Switch OFF.
2. Turn both MAIN BREAKERS OFF.
3. Separate the fuel Quick-Connects and remove the fuel pressure gauge. Reinstall the pressure tap plug.
4. Reconnect the fuel Quick-Connects.

NOTE: You may need to install a smaller nozzle at high elevations or if the ambient temperature falls below 10°F (-12°C). The table below shows the approximate firing rate at various fuel pressures with the 5.0 GPH nozzle:

Fuel Pressure		Firing Rate
<u>psi</u>		<u>GPH</u>
125	-	5.59
130	-	5.70
140	-	5.92
150	-	6.12

MAINTENANCE

The Pureheat™ Hydronic Air Heater must be operated only with Ground Heaters Heat Transfer Fluid (HTF).

The standard Pureheat™ contains 145 US gallons (535 liters) of HTF for normal operation. Ground Heaters, Inc. recommends that the HTF be replaced every three years to ensure that the corrosion inhibitors are sufficiently active to protect the system components.

4.1 ADDING HEAT TRANSFER FLUID

(Refer to Appendix B-10)

NOTE: Shut down all pumps (including optional Booster Pump). (If using optional Booster Pump, refer to Section 2.3.7, Optional Booster Pump.)

4.1.1 To Clear a "LOW LEVEL FAULT"

1. Place an open container of HTF close to the manifold area to facilitate filling. The container must be close enough to allow the 16 ft (4.9 m) fill hose to reach the bottom of the container.
2. Power up the Pureheat™ as directed in Section 2.4, START UP.
3. Ensure that the PUMP and BURNER Switches are OFF.
4. Ensure that a least one section of circulation hose is connected to the supply and return manifolds to complete a circulation loop.
5. Verify that valve #3 is shut.
6. Verify that valves #2 and #5 are open.
7. Pull out the fill hose (attached to valve #4). Clean the exterior and remove the fill hose dust cap.
8. Remove the locking pin from fill valve #4.
9. Direct the open end of the fill hose into the opening of the HTF container.
10. Momentarily open fill valve #4 until HTF is observed running out of the fill hose. This will "prime" the fill hose.
11. Quickly close fill valve #4 to avoid over filling the HTF container.
12. Cover the open end of the fill hose to retain HTF after priming.



NOTE: If the HTF container height is such that it will not allow gravity flow from the Pureheat™ fill hose, use a separate container with an opening low enough to facilitate priming the fill hose using the method described.

13. Insert the fill hose into the HTF container, ensuring that the hose is not sealed against any interior surface of the container.
14. Open fill valve #4. Immediately lift and hold the HTF FILL Switch to begin filling. (Photo 4-1)
15. Continue filling using the HTF FILL Switch until fluid is observed in the bottom of the sight gauge.
16. The LOW LEVEL RESET button may now be pressed to clear the low level shutdown condition. It is not necessary to stop the filling process during this step. (Refer to Appendix B-10)

17. After the Low Level Shutdown device has cycled through a 15 second self test, the low level condition will clear.
18. The PUMP Switch may now be turned ON, and the HTF FILL Switch released to finish filling.
19. Continue filling until the HTF level is between the MIN and MAX as observed in the HTF sight gauge. Do not over fill.
20. Once adequate HTF levels are verified in the Sight Gauge, remove the Fill Hose from the HTF container but continue running the HTF pump. Elevate and outstretch the Fill Hose to clear excess fluid from the hose.
21. Close fill valve #4 and insert the locking pin. Open Pump Suction Valve #3.
22. Clean the Fill Hose exterior and replace the dust cap. Stow the hose neatly in-between the HTF Pump and the Supply/Return manifold rack.

NOTE: HTF Low Level Shutdown Device red (Low Water) light will blink for 15 seconds while device performs self-diagnostic tests. After 15 seconds the red light will go out and the green light will stay on, signaling the unit is ready to operate. The red LOW LEVEL FAULT light on the control panel will also go out.

4.2 BURNER INSTALLATION/CHANGEOVER

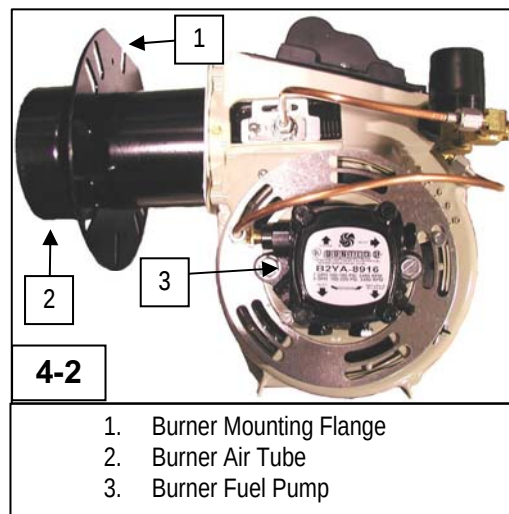
4.2.1 From NG/LP to Diesel/Fuel Oil

1. Burner setup and installation, fuel supply connection, test-firing and Burner adjustment should be performed by an experience fuel oil Burner professional and must conform to the requirements of local, state and federal authorities.
2. Main heater unit (trailer) must not be installed within 12 ft (3.6 m) of combustible materials.
3. To ensure proper Burner performance and to avoid machine downtime due to heater sooting, Burner combustion verification and adjustment must be performed:
 - Before starting at a new job site.
 - Before operating at altitudes 1,000 ft (305 m) above or below the last adjustment.
 - After any Burner maintenance has been performed.
 - After installing any Burner, even if it had been previously used and calibrated.
 - If Burner performance is in question for any reason.
4. A Combustion Analyzer, Smoke True Spot Tester and common hand tools will be required.

4.2.1.1 Installation (Photo 4-2)

NOTE: All CF800 oil Burners are shipped by Ground Heaters, Inc. with the proper nozzle (5.0 GPH 60° solid) installed and the fuel pressure set at 150 psi.

1. Slide the flange gasket over the Burner air tube and align the gasket with the mounting flange holes.
2. Install the ½ in. insulation and the Burner mounting plate for the oil Burner (supplied when you purchase an oil Burner) on the hydronic heater.
3. Insert the Burner air tube into the hydronic heater and install the four bolts which have been supplied.



4. Using the supplied 1¼ in. x 5/16 in. bolts, washers and nuts, install the Burner support bracket on the trailer floor below the Burner. Extend the adjusting rod such that the round pad firmly contacts the underside of the blower housing on the Burner. Tighten the jam nut to keep the support rod from backing off.
5. Attach the 3-pin Quick-Connect Fuel Line power cord leading from the Main Control Panel to the mating part located just below the Honeywell controller on the Burner.
6. Connect the Pigtails for the Burner Inline Fuel Heater. The Male portion is attached to the Burner and the female portion is attached to the Main Control Panel.
7. Route the Supply and Return Fuel Lines from the Fuel Tank through the 5 in. (127 mm) square access hole in the trailer floor below the Burner.
8. Using the Quick-Connect and hose barb supplied with the Oil Burner, attach the Supply Fuel Line to the Fuel Filter on the Burner.
9. Attach the Return Fuel Line to the return hose Quick-Connect and hose barb on the Burner.

4.2.1.2 Setup

1. Set the Burner Air Band at 6 and Air Shutter at 6. These initial air settings will be fine tuned later.
2. With fuel in the remote tank, power up the Pureheat™ control panel as directed in Section 2.4, START UP.
3. After the low level device runs through its self diagnostic cycle, the Burner should pre-purge and then light. The oil primary control on the Burner may have to be re-set several times for the initial start up to purge air out of the fuel supply line.
4. Follow procedures in Sections 3.2.1.1 through 3.2.1.4 to complete Burner adjustment.

4.2.2 From Diesel/Fuel Oil to NG/LP

1. Burner setup and installation, fuel supply connection, test-firing and Burner adjustment should be performed by a licensed professional and must conform to the requirements of local, state and federal authorities.
2. All gas and propane connections must be leak tested prior to placing into service.
3. Main heater unit (trailer) must not be installed within 12 ft (3.6 m) of combustible materials.
4. All gas Burners are test fired at Ground Heaters, Inc.'s factory prior to shipment.
5. To ensure proper Burner performance and to avoid machine downtime due to heater sooting, Burner combustion verification and adjustment must be performed:
 - Before starting at a new job site.
 - Before operating at altitudes 1,000 ft (305 m) above or below the last adjustment.
 - After any Burner maintenance has been performed.
 - After installing any Burner, even if it had been previously used and calibrated.
 - If Burner performance is in question for any reason.
6. A Combustion Analyzer, Smoke True Spot Tester and common hand tools will be required.



Do not exceed 14 in. water column gas supply pressure. Excessive pressure will damage the gas train components.

NG: Do not exceed 3.0 in. water column manifold pressure, as this will over-fire the heater and cause damage.

LP: Do not exceed 2.0 in. water column manifold pressure, as this will over-fire the heater and cause damage.

4.2.2.1 Installation

(Refer to Appendix A-24)

1. Remove the trailer enclosure lower panel located below the trailer's left side door adjacent to the fender (to provide unrestricted access to the Burner mounting plate on the Pureheat™ Hydronic Air Heater). (Photo 4-3)
2. Verify that the gasket is properly positioned on the mounting flange and Burner blast tube.
3. Insert the blast tube into the hydronic heater Burner mounting plate and attach with the four bolts which have been supplied. The Burner should be oriented with the Power Flame Model JR30A-12 label oriented right side up.
4. Using the supplied 1¼ in. x $\frac{5}{16}$ in. bolts, washers and nuts, install the Burner support bracket on the trailer floor below the Burner. Extend the adjusting rod such that the square pad firmly contacts the Burner support flange. Tighten the jam nut to keep the support rod from backing off.
5. Reinstall the enclosure panel next to the fender.
6. Attach the 3-pin Quick-Connect Burner power cord leading from the Main Control Panel to the connection socket located just behind the blue Honeywell™ Burner control.
7. Attach the gas train at the pipe union (secure to gas train mounting bracket), with the horizontal portion of the gas train extending toward the tongue of the trailer. Do not use pipe dope on this joint.
8. Attach the 2-pin Quick-Connect power cord leading from the Burner control to the electrical junction box mounted on the gas train.
9. Connect the 90° end of the braided pilot gas line to the fitting provided on the left side of the gas train. do not use pipe dope on this joint.
10. Verify that the two ball valves and the pilot valve on the gas train are turned OFF.
11. Attach the 36 in. x ¼ in. poly vent hose to the main gas pressure regulator vent and route it outside through the 5 in. (127 mm) square access panel in the floor.
12. Attach the 17 in. x ¼ in. poly vent hose to the pilot pressure regulator and route it outside through a slot in the trailer floor along the left side of the trailer.
13. Attach the NG or LP gas supply line to the main gas inlet fitting at the left side of the gas train. This gas line should enter the trailer through the 5 in. (127 mm) square access panel in the floor of the trailer.



4.2.2.2 Setup

1. Open the top Burner air inlet damper 100 percent. The bottom air inlet damper should be completely closed. This initial setting will be fine tuned later.
2. Follow procedures located in Sections 3.1.1.1 through 3.1.1.4 to complete Burner adjustment.



Do not turn on the gas at this time.

NOTE: The gas supply line must be sized such that it is capable of providing a minimum of 860 CFH NG (or 344 CFH LP vapor) at 5 to 14 in. water column pressure.

4.3 HIGH ALTITUDE OPERATIONS

1. The following procedures are recommended when operating the Pureheat™ at altitudes higher than 5,000 ft (1,524 m) asl. These procedures keep the Pureheat™ running smoothly and prevent the possibility of premature soot build-up inside the hydronic heater fire tubes. **ALL PROCEDURES LISTED BELOW SHOULD BE PERFORMED BY CERTIFIED PERSONNEL AT YOUR GROUND HEATERS DISTRIBUTOR.**
2. When operating the Pureheat™ at high altitudes, the hydronic heater should be checked every 500 hours for sooting or other combustion abnormalities. Combustion Analyzer and Smoke Spot Tester must be used for this test.
3. In addition to air adjustments, fuel pressure may be reduced to a lower pressure. To decrease fuel burning rate, refer to Section 3, BURNER ADJUSTMENT AND SHUTDOWN for fuel pressure adjustment instructions.

NOTE: Always verify Burner exhaust O₂ and smoke levels after completing any adjustments to fuel pressure as directed in Section 3.1.1, Gas Burner Adjustment or 3.2.1, Diesel Burner Adjustment.

4.4 RECOMMENDED FUELS

1. Pureheat™ Hydronic Air Heaters are typically used outdoors, in cold weather.



Care must be taken in selecting a fuel blend which will work properly in your jobsite conditions.

2. Diesel fuel will thicken (gel) at low temperatures. Gelling (also known as waxing) may cause the Burner not to light and/or fuel pump damage.
3. Contact your local fuel supplier to obtain potential gelling temperatures for your fuel, as specifications for diesel fuel vary from terminal to terminal. Some fuel suppliers may add products such as ValveTect to prevent gelling or Diesel 911 after gelling has occurred. Your fuel supplier should supply this information and make recommendations for the selection and use of such products.
4. If ambient temperatures are such that your fuel supplier cannot insure the fuel will not gel, K1 Kerosene or #1 diesel fuel (dyed K1 for off-road use) must be added by ratio until gelling does not occur.
5. Refer to the Fuel Blend Guide, below; consult your fuel supplier for assistance in calibrating these values to your fuel.

DIESEL FUEL SELECTION	
Low overnight ambient air temperatures can cause diesel fuels to gel. Gelled fuel will cause the Burner not to light and/or fuel pump damage. ALWAYS USE THE PROPER FUEL	
LOWEST EXPECTED AMBIENT AIR TEMPERATURE	PROPER FUEL
5°F AND BELOW	100% #1 DIESEL OR 100% K-1 KEROSENE
5°F TO 25°F	50% #2 DIESEL + 50% #1 DIESEL } BLEND
ABOVE 25°F	WINTER BLEND DIESEL

Require your fuel supplier to guarantee that the fuel supplied will not gel at the lowest temperature which will be experienced at your work site.

4.5 SUMMER STORAGE INSTRUCTIONS

1. Allow the heater to cool sufficiently. Cover the chimney and the Burner with plastic wrap or other waterproof material. This will prevent corrosive moisture build-up and blockages caused by animal nests. Burners not installed should be stored in a cool, dry place.
2. Remove emergency break-away battery and store the battery in a cool, dry place. Connect the battery to a trickle charger once every 30 days to maintain full charge.
3. Perform a thorough inspection for leaks, and correct. Double-check that all valves are shut.
4. Ensure all manifold Quick-Connect covers are in place and secured.
5. Shut and lock all doors.
6. Protect the tires from direct sunlight if stored outdoors.

NOTE: Do not drain the HTF. The heater and plumbing must remain flooded with HTF to prevent corrosion (rusting).

4.6 PRE-SEASON MAINTENANCE

(Refer to Section 3 of the Service Manual for detailed instructions.)

1. Remove all waterproof wrapping or covering from the chimney and Burner.
2. Test and reinstall emergency break-away battery.
3. Remove the Flue Access Door to inspect the Hydronic Heater Interior and fire tubes. Clean out any soot or flaked material. Remount the Flue Access Door.
For Oil Burners: Remove the Burner electrode assembly. Replace the nozzle with an exact replacement. Adjust or replace the electrodes as necessary.
4. Remove the Burner to inspect and clean the flame head.
5. Replace fuel filter element.
6. Reinstall the electrode assembly and verify the "Z" distance is correctly set.
7. Remount Burner using a new Burner mounting gasket.
8. Adjust Burner settings as directed in Section 3, BURNER ADJUSTMENT AND SHUTDOWN.
9. Verify HTF level.

TRANSPORTING THE PUREHEAT™ HYDRONIC AIR HEATER

This section describes the three basic methods of Pureheat™ Hydronic Air Heater transport and associated precautions.

5.1 TOWING

The Pureheat™ is easily towed by a vehicle rated to tow up to 8,500 lbs (3,855 kg) (HX Package) or 11,300 lbs (5125 kg) for the fuel tank package. The tow vehicle must be fitted with a Class V or above hitch. (Photo 5-1)

The Pureheat™ has a tongue weight of 895 to 1,446 lbs (405 - 657 kg) depending on configuration. Towing vehicle must be equipped with an electric brake system controller.

NOTE: A trailer plug wiring decal is located on the inside frame wall across from the trailer junction box. (Refer to Appendix A-22 and Appendix A-23)



5.2 AERIAL LIFTING

The Pureheat™ is equipped with a lifting bail. The lifting bail has multiple holes to provide balance with various configurations.



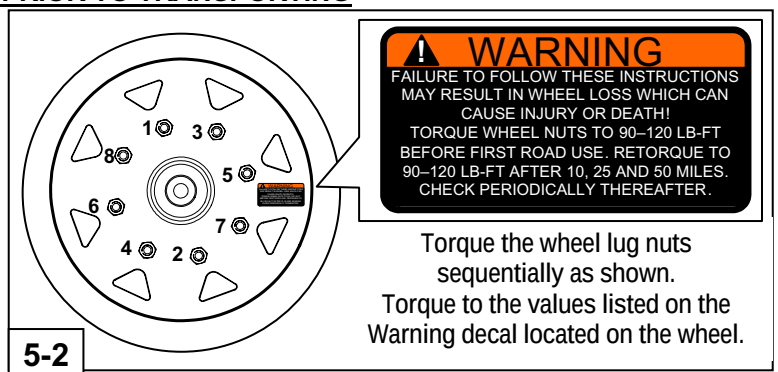
A qualified rigger should set up and perform all rigging.

5.3 TRANSPORTING on a FLATBED

The Pureheat™ may be loaded onto a 98 in. (250 cm) or wider flatbed using common-sized loading ramps and docks. The Pureheat™ should be chained down to the flatbed trailer. (Refer to Appendix A-27)

5.4 COMMON MECHANICAL INSPECTIONS PRIOR TO TRANSPORTING

1. Trailer lights, brakes, wiring and wheel bearing inspection.
2. Tires inflated to proper pressure and free of defects.
3. Plumbing, internal and field hose integrity check.
4. Lug nuts torque value is as directed on wheel decal. (Photo 5-2)



TROUBLESHOOTING

6.1 TROUBLESHOOTING CHART

(Contact your local Ground Heaters Distributor for situations not covered in this section.)

NOTE: Discontinue troubleshooting activities and shut down the Pureheat™ Hydronic Air Heater if one of the following occurs:

1. One of the GFIs trips and will not remain reset.
2. An electric motor "hums" but does not turn.
3. The Burner Safety will not reset when the MANUAL RESET button is pushed.
4. Dark smoke emits from the hydronic heater exhaust.

Once the Pureheat™ is shut down; call your local Ground Heaters Distributor for assistance.

Symptom	Possible Cause	Corrective Action	Refer To
Heat transfer fluid pump will not start.	No power due to incorrect switch position or protective function.	• Verify <u>both</u> MAIN BREAKERS are ON. • Verify <u>both</u> GFIs are reset. • Verify LOW LEVEL FAULT light is <u>not</u> lit. • Verify HTF level is between MIN and MAX.	Appendix A-2 Section 2
	Motor internal overload is tripped.	• Allow motor to cool; it will reset automatically.	-----
Heat transfer fluid pump turns but does not start.	Low voltage caused by inadequate power supply; poor quality; or excessively long extension cords.	• Have an electrician verify voltage at control panel is 110 volts (min.) <u>while attempting to start pump motor</u>. • Ensure power cords are at least 10 gauge wires and ≤ 100 ft (30.5 m) in length. • Verify power cords are supplied by separate 20 amp 120 volts AC 60 Hz electrical power circuits.	-----
	HTF too cold (-20°F [-28.9°C]).	• Warm HTF pump.	
Heat transfer fluid pump turns but trips breaker.	HTF too cold.	• Warm HTF pump.	-----
	Low Voltage.	• Correct low voltage.	-----
	Pump pressure below 30 psi.	• Throttle valve #2.	Section 2.4
Burner motor will not start.	Insufficient power supply.	• Have an electrician verify voltage at burner motor is 110 volts (min.) while attempting to start burner motor. • Ensure power cords are at least 10 gauge wires and ≤ 100 ft (30.5 m) in length. • Verify power cords are supplied by separate 20 amp 120 volts AC 60 Hz electrical power circuits.	-----
	Power supply sufficient but no power to burner motor.	• Call your Ground Heaters Distributor.	-----

Symptom	Possible Cause	Corrective Action	Refer To
Burner motor will not start (. . .continued)	Improper switch position or protective function action.	• Verify <u>both</u> MAIN BREAKERS are ON. • Verify <u>both</u> GFIs are reset. • Verify LOW LEVEL FAULT light is <u>not</u> lit. • Verify HTF level is between MIN and MAX level. • Verify LOW LEVEL SHUTDOWN DEVICE is RESET.	Appendix A-2 Section 2 Appendix A-18
	Burner Safety is tripped as indicated by DIAGNOSTIC light on burner control.	• Reset burner safety.	Appendix A-10 or A-13
Burner safety trips (no flame).	No fuel.	• Verify fuel supply is adequate. • Verify <u>both</u> fuel line Quick-Connects are connected (oil burner).	----- Section 4.2.1.1
	Insufficient voltage for ignition.	• Have an electrician verify voltage at control panel is 110 volts (min.) <u>while attempting to start burner</u>. • Ensure power cords are at least 10 gauge wire and ≤ 100 ft (30.5 m) in length. • Verify power cords are supplied by separate 20 amp 120 volts AC 60 Hz electrical power circuits.	-----
Burner safety trips (flame occurs).	Control not sensing flame.	• Call your Ground Heaters Distributor.	-----
Heat exchanger blower will not start.	• No electrical power. • Thermostat or speed selector setting incorrect.	• Verify 120 volts AC to heat exchanger. • Set thermostat above room temperature. • Set speed selector to desired fan speed.	-----
Hoses will not rewind.	Brake not fully released.	• Fully release hose reel brake.	Section 2.6.3
	Rewind motor is too cold (rewind motor may not start if below 0°F [-18°C]).	• Warm rewind motor.	-----
	Faulty foot pedal.	• Call your Ground Heaters Distributor.	-----

If problem is not resolved by performing the above steps, call your Ground Heaters Distributor for assistance.

6.2 HTF LOW LEVEL FAULT AND LIGHTS

(Refer to Appendix A-18)

Perform the following when HTF LOW LEVEL FAULT light (refer to control panel) is it: (Photo 6-1)

1. Turn BURNER, PUMP and REWIND MOTOR switches OFF.
2. Locate and correct cause of low HTF condition (i.e. fix the leak).
3. Restore HTF level to normal operating level per Section 4.1, ADDING HEAT TRANSFER FLUID.
4. Depress MANUAL RESET button to clear low level condition. Reset will complete in 15 seconds.

NOTE: Call your Ground Heaters Distributor if HTF level is between MIN and MAX and:

- **Low Level Shutdown device will not reset;**
- **LOW LEVEL FAULT light (refer to control panel) remains on after depressing the Low level Shutdown device RESET button; or**
- **Burner control locks out the burner and will not remain reset.**

6.2.1 Low Level Shutdown Device

The LOW LEVEL FAULT light is activated for 15 seconds after initial power up and then goes out. Reset is accomplished by pressing the RESET button for 1 to 2 seconds or by momentarily shutting OFF BREAKER 1.

6.2.2 Testing the Low Level Shutdown Device

Power up the main control panel by following the steps outlined in Section 2.4, START UP. Observe the LOW WATER and POWER lights on the bottom of the Low Level Shutdown Device. Ensure that the Green POWER light is ON and the Red LOW WATER light is OFF.



LOW LEVEL FAULT

Press and hold the TEST button while monitoring the red LOW WATER light.

The red LOW WATER light will flash 10 times followed by the main control panel LOW WATER light will be on.

The green POWER light and the LOW WATER light will both be ON.

Verify that the LOW LEVEL FAULT light is ON at the main control panel.

Turn the PUMP and the BURNER switches ON one at a time at the main control panel to verify that the PUMP AND BURNER ARE NOT OPERATIONAL.

RESET

Turn the PUMP and BURNER switches OFF.

Momentarily press the RESET button. The LOW WATER and POWER lights will flash simultaneously 4 times and the POWER light will return to normal operating mode. The LOW WATER light will continue to flash an additional 14 times and return to normal operating mode. The POWER light will be ON, the LOW WATER light will be OFF and the LOW LEVEL FAULT light at the main control panel will be OFF.

Turn the burner switch ON and the burner will start after a five second delay. After the burner starts, turn the BURNER switch OFF.

Turn the pump switch ON and the pump will start immediately. Turn the PUMP switch OFF.

If the test does not conform to the instructions and results as outlined above, call your Ground Heaters distributor.

6.3 BURNER CONTROL LOCKOUT

(Refer to Appendix A-13 or A-8 through A-14)

6.3.1 Gas Burner Control

The POWER light will illuminate only during the heating cycle. After flame is established, the POWER, PILOT, MAIN and FLAME lights should all be illuminated.

If flame failure of any nature is sensed during the start up or heating cycle, the control will stop all burner function and begin Lockout mode.

Lockout Mode

- ALARM light will illuminate
- PILOT, FLAME and MAIN lights will go out.

Momentarily press the RESET button to clear the lockout condition.

6.3.2 Oil Burner Control

The DIAGNOSTIC light (green LED) will illuminate during the heating cycle after the 15 second pre-purge time has elapsed and flame has been established.

If flame failure is sensed during the start up or heating cycle, the control will stop all burner function and begin one of three protective modes:

1. Recycle Mode

The DIAGNOSTIC light will flash in two second intervals while attempting three automatic restarts. If the flame fails after three successive attempts, the control will go into Lockout mode.

2. Lockout Mode

The DIAGNOSTIC light will flash in one-half second intervals.

The RESET button must be momentarily pressed to clear the lockout and attempt a burner restart.

After three attempts to manually clear the lockout mode, the control will begin Restricted Lockout mode.

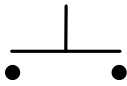
3. Restricted Lockout Mode

The DIAGNOSTIC light will flash in one-half second intervals.

The RESET button must be pressed and held for 30 seconds or until the DIAGNOSTIC light comes on for two seconds and then goes out.

The control will return to Restricted Lockout mode with each flame failure until one successful heating cycle has occurred.

SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND



PUSH BUTTON SWITCH, MOMENTARY, NORMALLY OPEN: A momentary push button switch that CLOSSES on activation (makes contact when pushed) such as the LOW OIL PRESSURE OVERRIDE Switch



PUSH BUTTON SWITCH: A two position push button switch such as the EMERGENCY STOP Switch



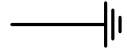
PRESSURE SWITCH, MAKES ON RISE: A pressure operated switch that CLOSSES (makes contact) on an increase in pressure.



THERMOSTAT, MAKES ON RISE: A temperature operated switch that CLOSSES (makes contact) on an increase in temperature



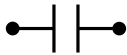
THERMOSTAT, BREAKS ON RISE: A temperature operated switch that OPENS (discontinues contact) on an increase in temperature



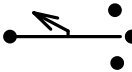
GROUND: May be used to show a frame (chassis) ground or a neutral connection.



NORMALLY CLOSED CONTACTS (N.C.): Relay contacts that are SHUT (making contact) when the relay coil is not powered or energized.



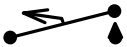
NORMALLY OPEN CONTACTS (N.O.): Relay contacts that are OPEN (not making contact) when the relay coil is not powered or energized.



TOGGLE SWITCH, TWO POSITION: An ON – OFF – ON bat handled switch such as the REWIND CLUTCH switch.



TOGGLE SWITCH: An OFF or ON bat handled switch such as the BURNER switch.



MOMENTARY TOGGLE SWITCH: A bat handled switch that automatically returns to the OFF position when released.



THERMAL FUSE: A fuse, motor overload or other heat reactive protective switch



RESISTIVE LOAD: Relay coils, resistance heaters, resistors.



SNAP DISC, MAKES ON RISE, AUTO RESET: A bi-metal disc that CLOSSES a switch should the temperature of the media it is sensing reach the set point (usually fixed). The Switch will return to its normal position after the temperature drops to a pre-determined level.



SNAP DISC, BREAKS ON RISE, MANUAL RESET: A bi-metal disc that OPENS a switch should the temperature of the media it is sensing reach the set point (usually fixed). The Switch can be reset only after after the temperature drops to a pre-determined level. This type of switch is commonly used as a high limit.



SNAP DISC, OPENS ON RISE, AUTO RESET: A bi-metal disc that OPENS a switch should the temperature of the media it is sensing reach the set point (usually fixed). The Switch will return to its “normal” position after the temperature drops to a pre-determined level. This type of switch is commonly used as a high limit.

SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND



TERMINAL STRIP CONNECTION POINT: Provides a transitional connection from Main Control Panel internal wiring and Main Control Panel exterior wiring. *Note: Terminal strip connection point numbers are the same as the wires attached*



TERMINAL IDENTIFIER: Identifies specific terminals on components with labeled terminals.

BLK
RED
WHT

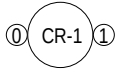
WIRE COLOR DESIGNATION: Identifies wire colors.

1
1
1

COLOR AND WIRE NUMBER DESIGNATIONS: Identifies wires by number and color to simplify troubleshooting.



CONNECTION POINT: A general connection point symbol used primarily on schematics to represent common connections such as wire nuts, lug screws or piggy-backed disconnects.



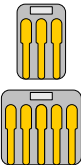
GENERIC LOAD: Relays, Motors and electrically operated valves etc.



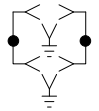
YELLOW WIRE NUT: Used to connect several wires. It is larger than the common orange wire nut and typically used with up to six 16 – 18 gauge wires.



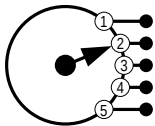
ORANGE WIRE NUT: Used to connect two or more 16 – 18 gauge wires.



WIRE CAGES: Used to connect up to five 16 – 18 gauge wires.



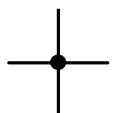
DUPLEX OUTLET: A receptacle used to plug in various loads such as a strobe light, Pump Pack or small resistance heaters..



ROTARY SWITCH: A common selector switch for various functions such as multi speed motors.



WIRE JUMP: Used to show wires that are adjacent but are not connected to each other.

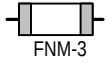


CONNECTION POINT: Used to show wires that are connected to each other by common means such as a lug, wire nut or crimp-on connector.

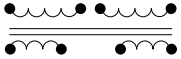
SCHEMATIC AND WIRING DIAGRAM SYMBOL LEGEND



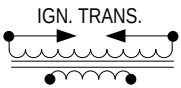
CAPACITOR: Used to add starting torque and efficiency to single phase electric motors.
Capacitors are rated by Microfarad (μf or mfd) and volts i.e.: 10 μf 370V = Ten Microfarads x Three Hundred Seventy Volts.



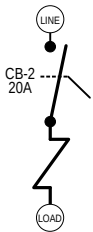
FUSE: Single use glass or fiber case fuses commonly used in electrical circuitry.
Their capacity is listed in the type number of the fuse i.e FNM-3 is a fuse with a Three Amp rating.



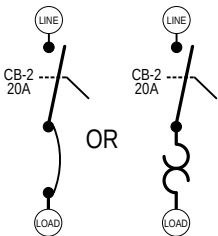
STEP DOWN TRANSFORMER: Used in GHI equipment to reduce 120 Volts AC to 12.6 Volts AC.



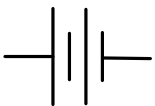
IGNITION TRANSFORMER: Increases 120 Volts AC up to 30,000 Volts to generate the high energy spark required to ignite fuel.



MAGNETIC CIRCUIT BREAKER: Trips when the electrical energy level through the breaker generates electromagnetic force in amounts sufficient to activate a mechanical (electromagnetic) device to force the Switch OPEN.



THERMAL CIRCUIT BREAKERS: Trips when the electrical energy level through the breaker generates heat in amounts sufficient to activate a thermo-mechanical (Bi-Metal) device to force the Switch OPEN.

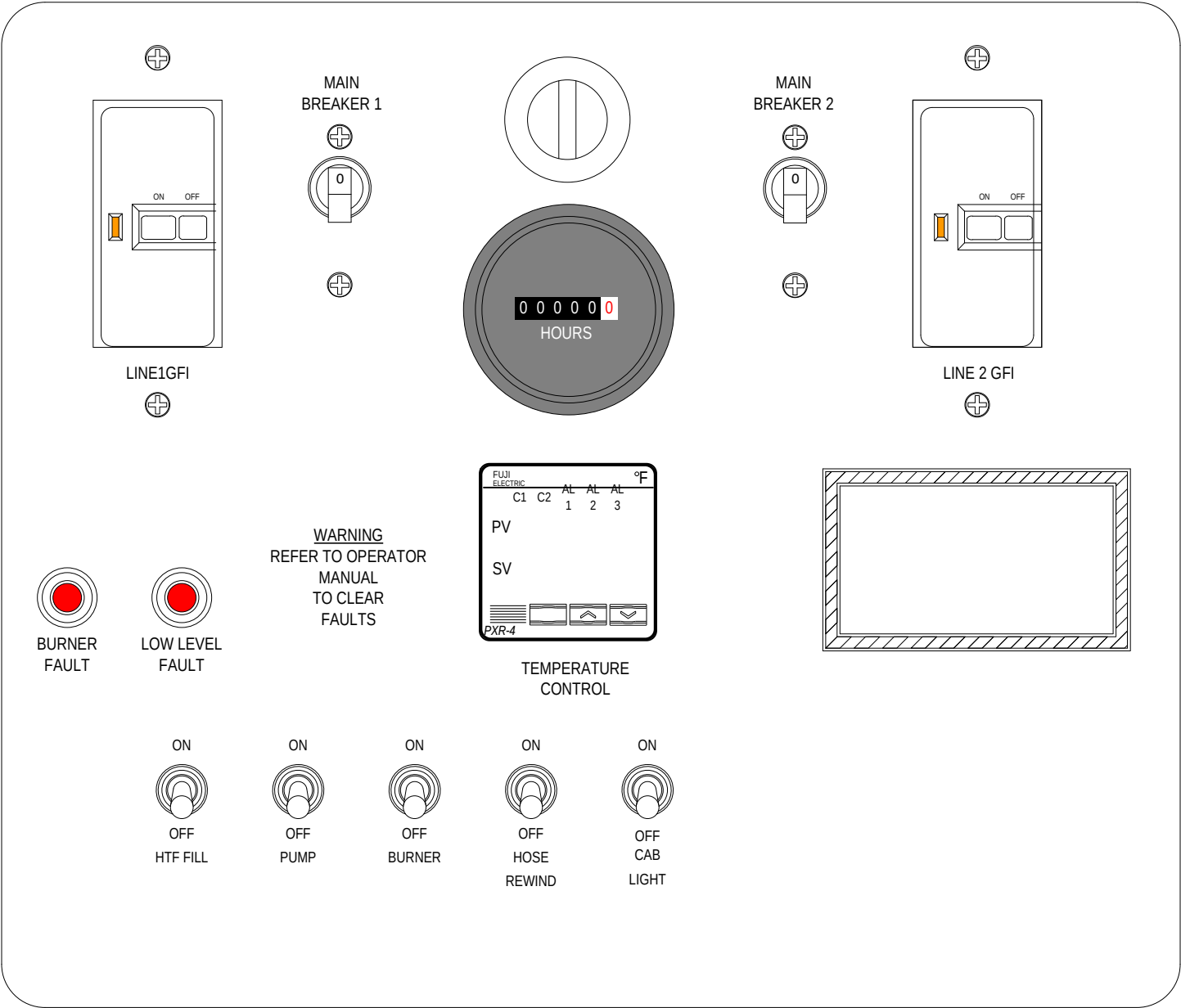


BATTERY: Typically 12 Volts DC batteries are used to start Generators or to provide power for Electric Trailer Brakes.

COMMON WIRE COLORS

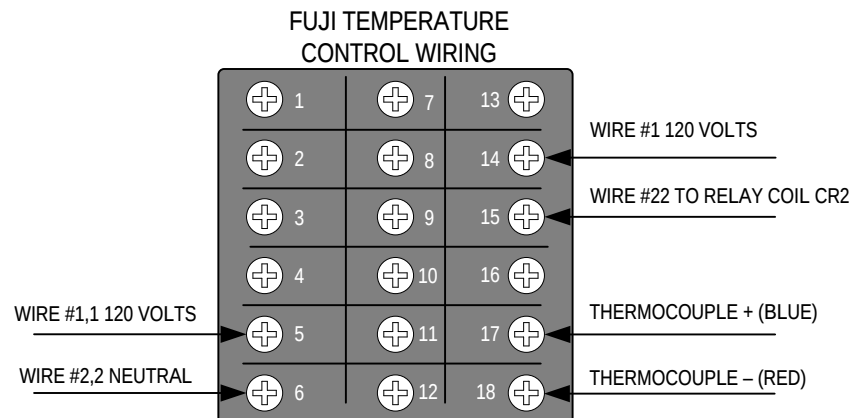
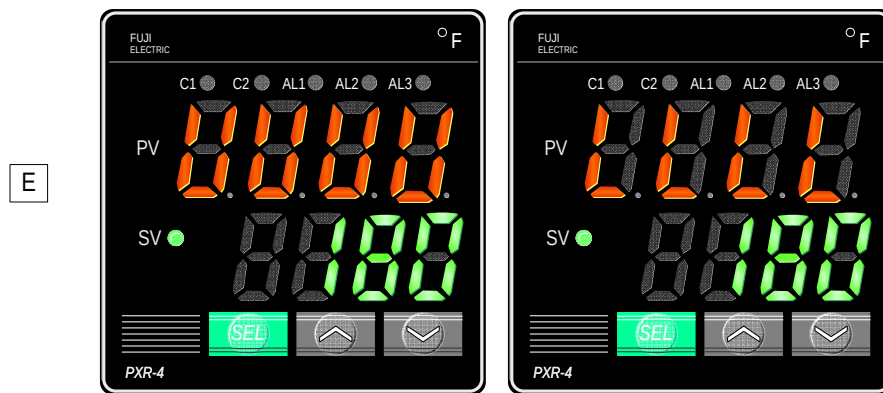
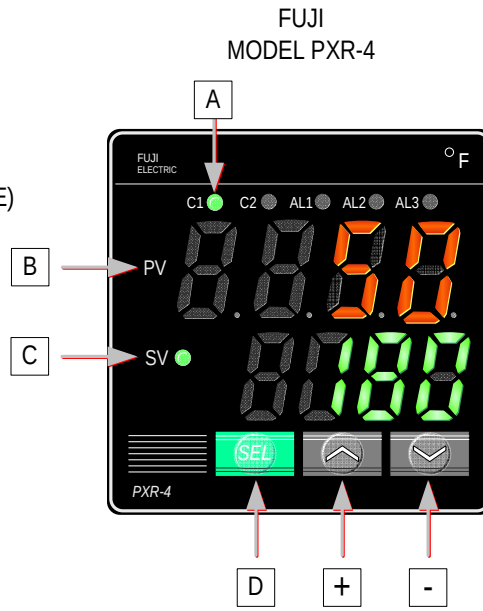
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
YEL	= YELLOW	
ORG	= ORANGE	
VIO	= VIOLET	
BRN	= BROWN	
PNK	= PINK	

PUREHEAT CONTROL PANEL EXTERIOR LAYOUT

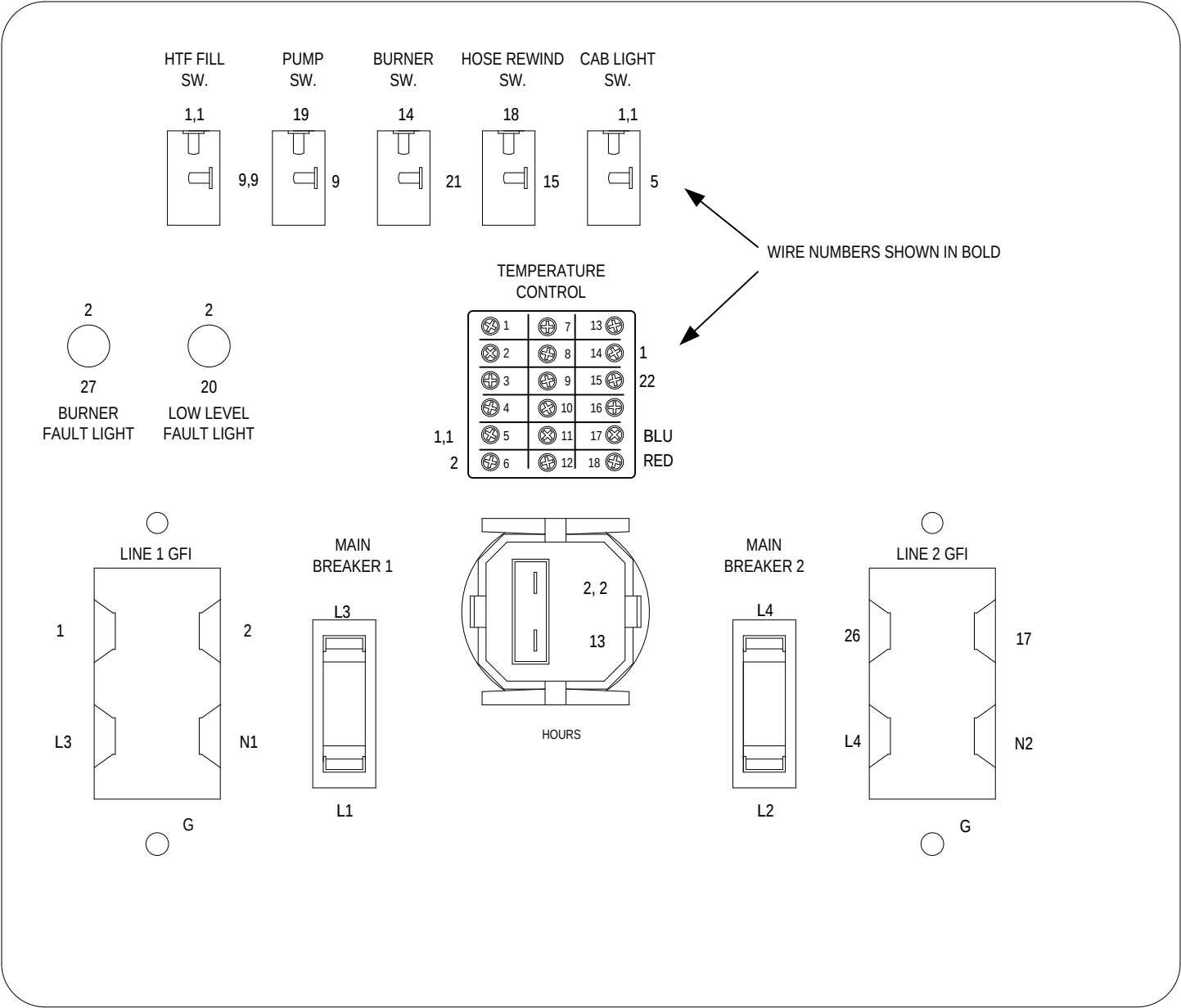


PUREHEAT TEMPERATURE CONTROL

- A HEATING DEMAND INDICATOR
- B PROCESS VALUE (HTF TEMPERATURE)
- C SET-POINT VALUE (DESIRED TEMPERATURE)
- D NOT USED
- E DISPLAY DURING THERMOCOUPLE (SENSOR) CONNECTION LOSS
- DECREASE TEMPERATURE
- + INCREASE TEMPERATURE



PUREHEAT CONTROL PANEL DOOR INTERIOR LAYOUT



PUREHEAT MAIN CONTROL PANEL

EXTERIOR COMPONENT FUNCTION AND IDENTIFICATION

DOOR COMPONENTS

BREAKER 1 CURVE 10 15 AMP. (P/N E100-354):

Provides ON and OFF power control and circuit protection for electrical circuit one.

BREAKER 2 CURVE 10 20 AMP. (P/N E100-123):

Provides ON and OFF power control and circuit protection for electrical circuit two.

LINE 1 GFI (P/N E100-093):

A Ground Fault Circuit Interrupter (GFI) which provides operator protection for electrical circuit one.

LINE 2 GFI (P/N E100-093):

A Ground Fault Circuit Interrupter (GFI) which provides operator protection for electrical circuit two.

HOURLY METER (P/N E100-096):

A meter to record total hours of use. The Hour Meter functions only when the BURNER Switch is turned ON and does not reflect actual burner run time.

TEMPERATURE CONTROL (P/N E100-084):

Provides ON and OFF control of the Burner based on set-point (desired temperature) as well as primary high and low temperature limit functions. The digital display panel indicates the Heat Transfer Fluid (HTF) temperature in red, the set-point (desired temperature) in green and output indication (demand for heat) by illuminating the C1 light in the upper left of the display panel. Set-point is adjusted using the UP and DOWN arrow Keys located below the display panel.

BURNER FAULT LAMP (P/N E100-353):

Indicates the Burner Control has sensed flame failure and has entered BURNER FAULT mode. All Burner functions are disabled during BURNER FAULT mode except for the Inline Fuel Heater (oil burner only) which is powered directly by the BURNER Switch.

LOW LEVEL FAULT LAMP (P/N E100-353):

Indicates that the Low Level Shut Down Device sensed an HTF loss and has entered LOW LEVEL FAULT mode. All Burner and Pump functions are disabled except for the Inline Fuel Heater (oil burner only) which is powered directly by the BURNER Switch.

HTF FILL SWITCH (P/N E100-230):

Used to operate the Pump during a LOW LEVEL FAULT to effect re-filling of HTF.

PUMP SWITCH (P/N E100-101):

Provides operation and control of the HTF Pump.

BURNER SWITCH (P/N E100-101):

Provides ON or OFF power control to the Burner.

REWIND MOTOR SWITCH (P/N E100-101):

Provides ON or OFF power control to the Rewind Motor.

CAB LIGHT SWITCH (P/N E100-101):

Provides ON or OFF power control to the Interior Cab Light.

[illegible]

P/N E100-205

P/N E100-359

P/N E100-382

P/N E100-220

P/N E100-225

PUREHEAT MAIN CONTROL PANEL

INTERIOR COMPONENT FUNCTION AND IDENTIFICATION

PANEL INTERIOR COMPONENTS

CR-1 RELAY (P/N E100-205):

Relay CR-1 is controlled by the Low Level Shutdown Device contacts C - B (NO) (normally open). Relay CR-1 contacts 8 – 7 (N.C.) (normally closed) control the 120V power to the LOW LEVEL FAULT light. CR-1 relay contacts 6 – 8 (N.O.) control the 120V power to the BURNER switch.

CR-2 RELAY (P/N E100-205):

Relay CR-2 is controlled by the normally open (NO) contacts 14 – 15 of the FUJI Temperature Control. Relay CR-2 contacts 6 – 8 (N.O.) are connected in parallel to the 3T & T connections on the Burner Control. Opening and closing relay contacts 6 – 8 will initiate or terminate the heating cycle.

CR-3 RELAY (P/N E100-382):

Relay CR-3 is controlled by the internal alarm contacts of the burner control (diesel burner) or by Relay CR-5 contacts COM and NO (LP/NG burner). The Relay CR-3 controls 120V power to the Accessories Power Receptacle via contacts COM and NC. The BURNER FAULT light is controlled by Relay CR-3 contacts COM and NO. 120V power to the Relay CR-3 COM is controlled by Relay CR-1 contacts 6 – 8 via the BURNER switch.

CR-4 RELAY (P/N E100-359):

Relay CR-4 Operating Coil is energized (powered) by the PUMP switch. Relay CR-4 contacts 2 – 3 (N.O.) control the 120V power to the HTF Pump.

CR-5 RELAY (P/N E100-383): (LP/NG burner only)

Relay CR-5 is controlled by the burner control's alarm contacts..

Relay CR-5 contacts COM – N.O. close during a burner fault to power the Relay CR-3 12 volt DC coil. Relay CR-5 is located beneath the Burner Control.

T-1 TRANSFORMER (P/N E100-220):

Reduces 120 volts AC current to approximately 12.6 volts AC current.

RECTIFIER (P/N E100-225):

Converts 12.6 volts AC current to 12.6 volts DC current as an operator safety feature of the rewind circuit.

FUSE 1 TYPE FNM-3 (P/N E100-356):

Provides circuit protection for the Rewind Motor and the line voltage portion of the Rewind Circuit.

FUSE 2 TYPE 3AG, 5.0 SB (P/N E100-357):

Provides circuit protection for the low voltage portion of the Rewind Circuit.

TERMINAL STRIP:

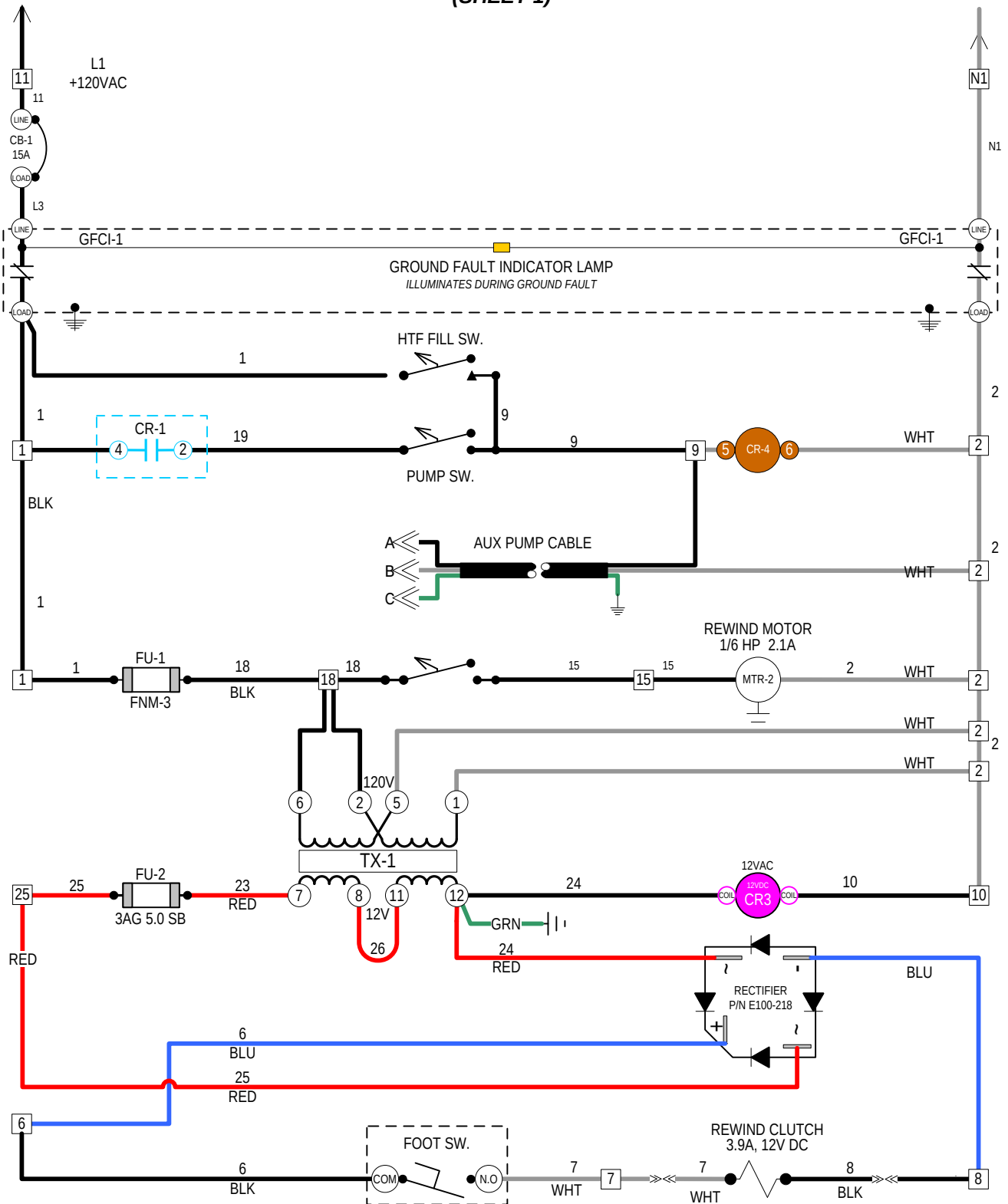
A transitional connection point between control panel interior and exterior components.

Numbered connection points share the same number as the wire connected to them.

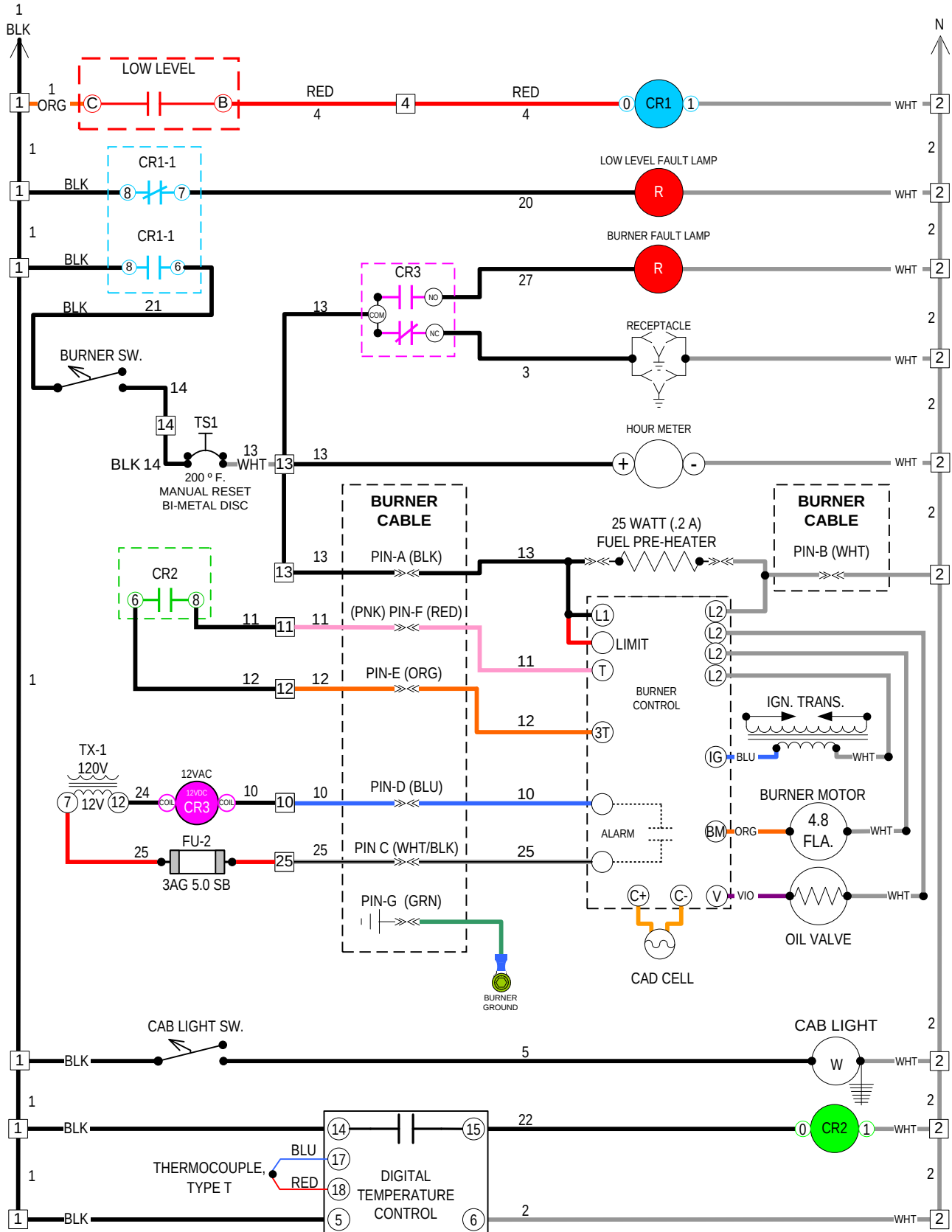
PUREHEAT WIRING SCHEMATIC

CIRCUIT 1

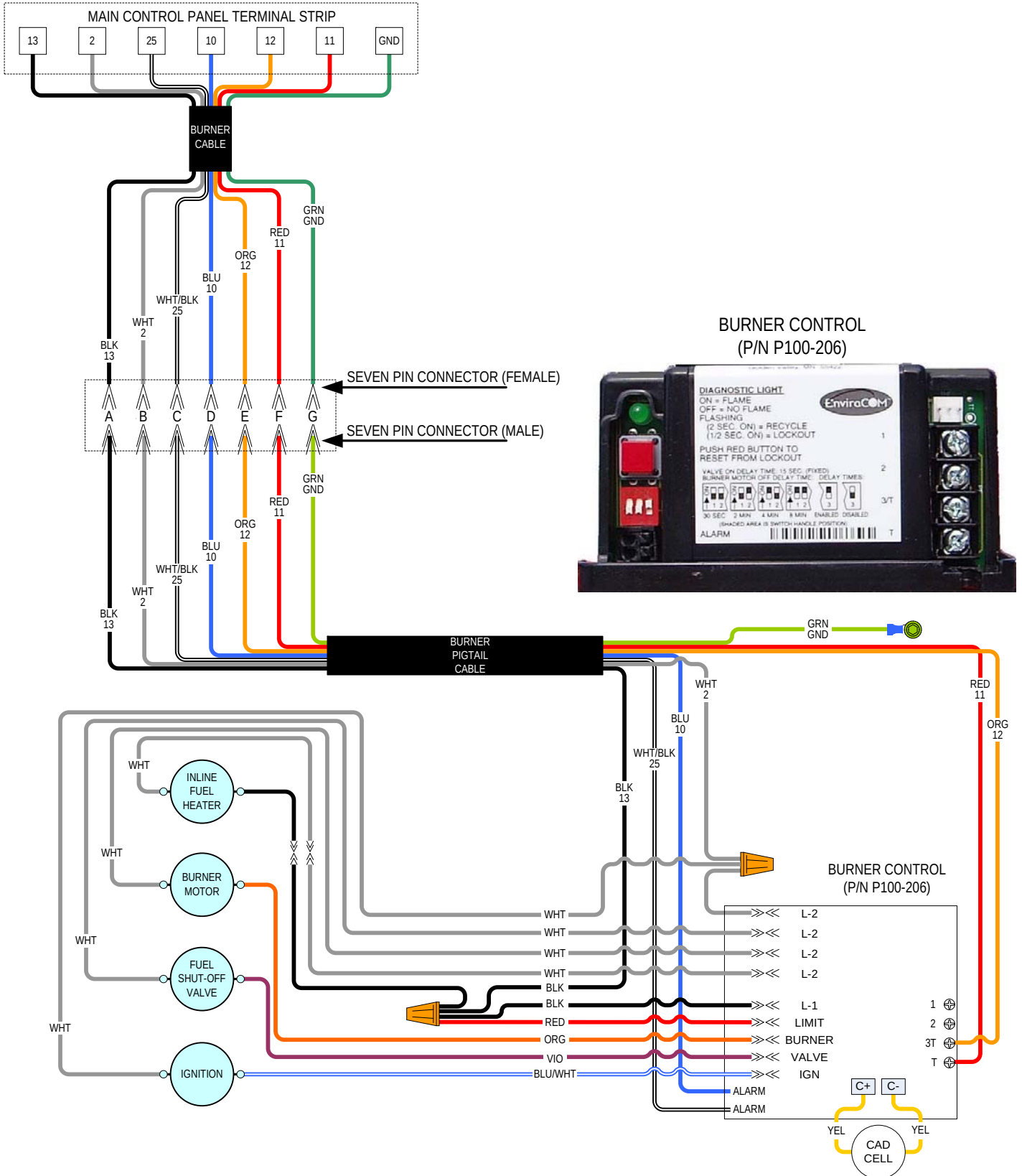
(SHEET 1)



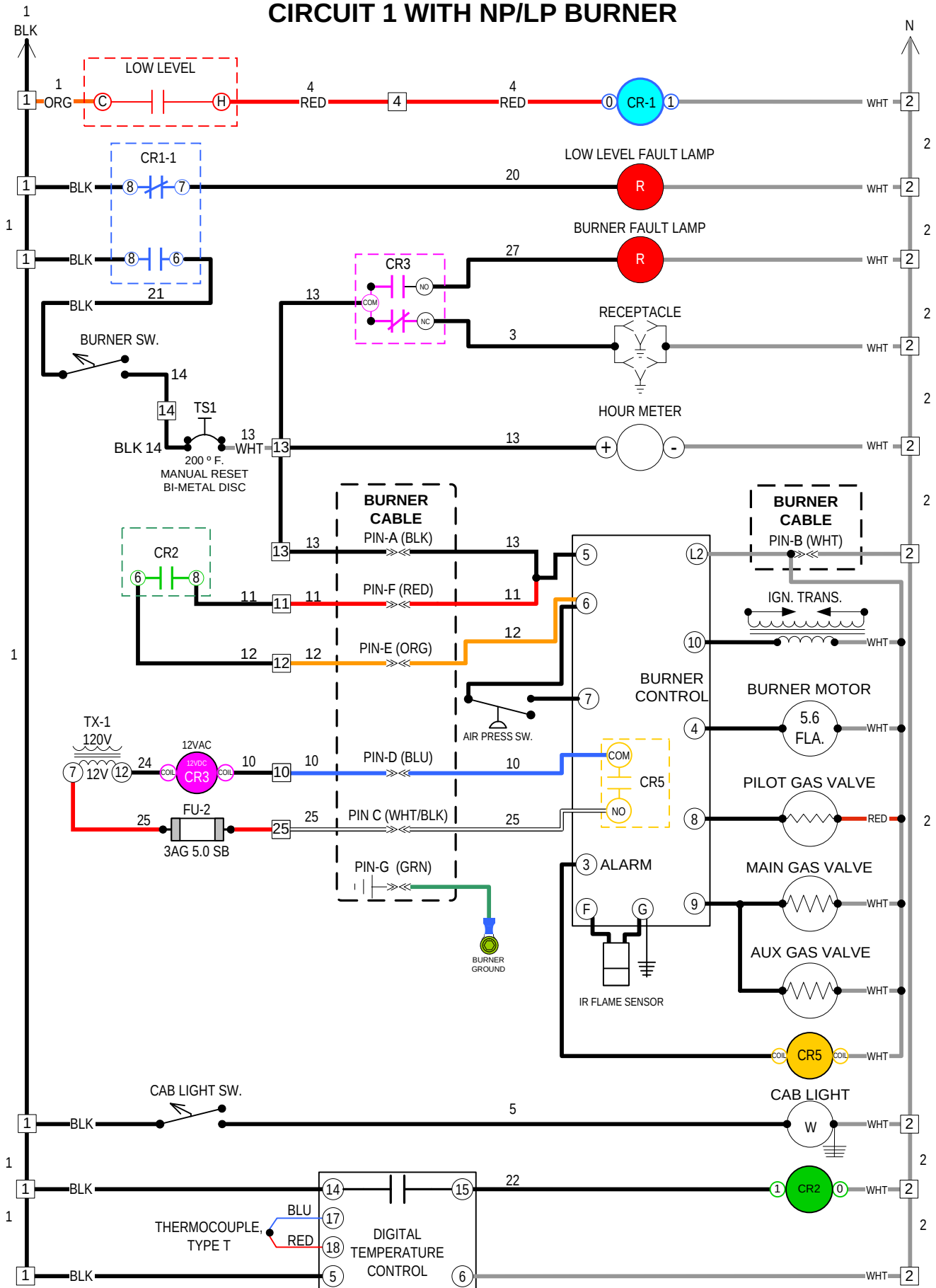
PUREHEAT WIRING SCHEMATIC (SHEET 2) CIRCUIT 1 WITH DIESEL BURNER



PUREHEAT SAFETY CONTROLS DIESEL BURNER WIRING



PUREHEAT WIRING SCHEMATIC (SHEET 3) CIRCUIT 1 WITH NP/LP BURNER



PUREHEAT DIESEL BURNER CONTROL

SEQUENCE OF OPERATION AND LOCKOUT

NORMAL SEQUENCE OF OPERATION:

Assuming a normal power up has been completed per Section 2 of this manual, the BURNER Switch is turned ON, the In-Line Fuel Heater is energized and begins to warm the fuel in the Nozzle Assembly Tube. With a demand for heat, output contacts 14 & 15 of the Temperature Control (TC) will close completing a circuit from L1 to the Burner Control Relay Coil (CR-2). Burner Control Relay (CR-2) normally open contacts 6 - 8 will CLOSE completing a circuit between 3T & T of the burner control.

The Burner Control initiates a 5 second self diagnostic test followed by a non-adjustable 15 second valve on-delay period called Pre-purge. During the Pre-purge cycle, both the Ignition Transformer and Burner Blower Motor are energized but fuel is not allowed to flow past the Fuel Shut-off Valve. Once the pre-purge cycle is complete, the Fuel Shut-off Valve Solenoid Coil is energized by the Burner Control and fuel flow is initiated to the Burner Nozzle. Once fuel flow has begun, a 10 second trial for ignition period begins. During trial for ignition, the Ignition Transformer remains energized for an additional 10 seconds, this is known as ignition carryover. Once flame is established and proven by a Cad Cell resistance value of more than 300 but less than 1600 Ohms, the Ignition and the ten second trial for ignition time has elapsed, the Ignition Transformer is de-energized for the duration of the heating cycle. Once the demand for heat has been satisfied, output contacts 14 & 15 of the TC OPEN breaking the circuit to Burner Control Relay Coil CR-2. The now de-energized relay will OPEN Relay CR-2 contacts 6 - 8 breaking the circuit at 3T to T of the Burner Control. The Burner Control will shut off the fuel supply to the burner nozzle by de-energizing the Fuel Shut-off Valve Solenoid coil. The Burner Blower Motor will continue to run for 15 seconds (post-purge cycle). The amount of time allowed for pre-purge depends on the Off-delay Dip Switch setting. Ground Heaters, Inc. recommends the factory setting of 15 seconds off-delay. Several delay settings are available as detailed on the front of the burner control.

BURNER FAULT:

If the Cad Cell senses an absent or unstable flame at any time during the heating cycle, the Burner Control immediately shuts down all Burner functions and enters one of three protective modes (BURNER FAULT). BURNER FAULT is identified by the Diagnostic Light (see photo below) and indicated by illuminating the BURNER FAULT Light (main control panel) simultaneously. The three BURNER FAULT or Lockout modes are described in detail below.

1. RECYCLE MODE:

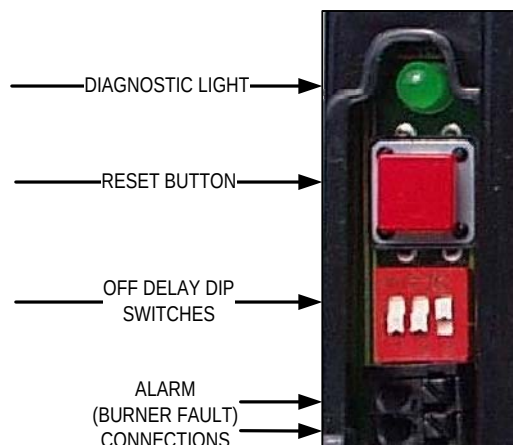
The DIAGNOSTIC Light will flash in two second intervals while attempting three automatic restarts. If the flame fails after three successive attempts, the control will enter **Lockout Mode**.

2. LOCKOUT MODE:

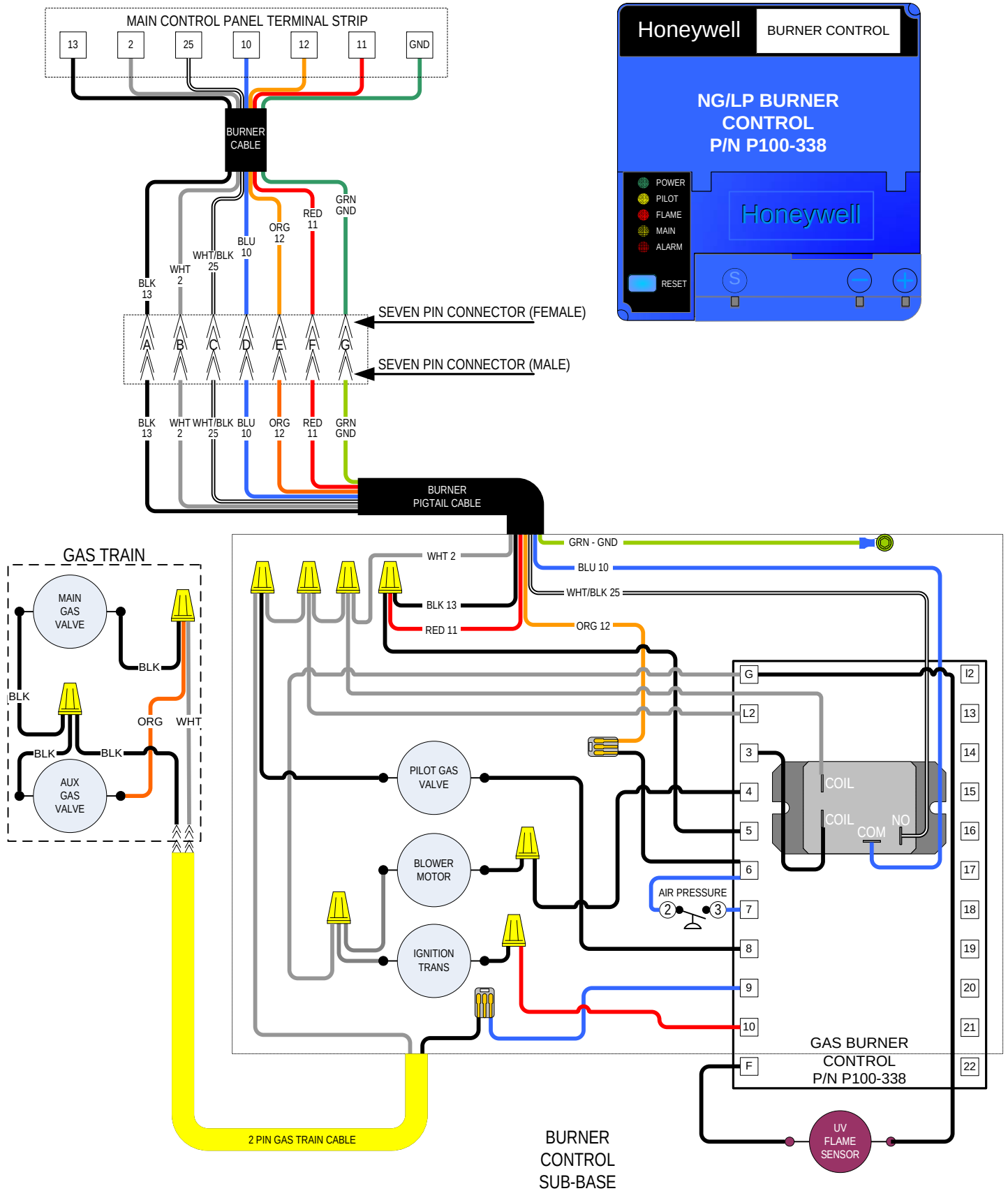
The DIAGNOSTIC Light will flash in ½ second intervals. The RESET button must be momentarily pressed to clear the Lockout and attempt a Burner restart. After the third attempt to manually clear the Lockout mode, the Burner Control will begin **Restricted Lockout Mode**.

3. RESTRICTED LOCKOUT MODE:

The DIAGNOSTIC Light will flash in ½ second intervals. The RESET button must be pressed and held until the DIAGNOSTIC Light comes on momentarily and then goes out. The Burner Control will return to **Restricted Lockout Mode** with each flame failure until one successful heating cycle has occurred.

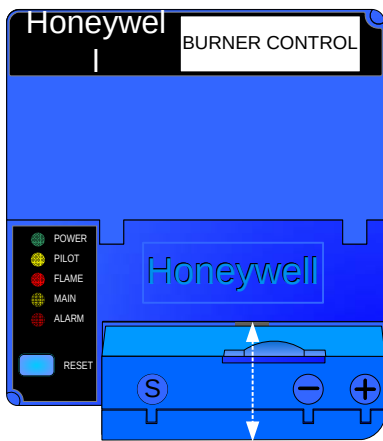
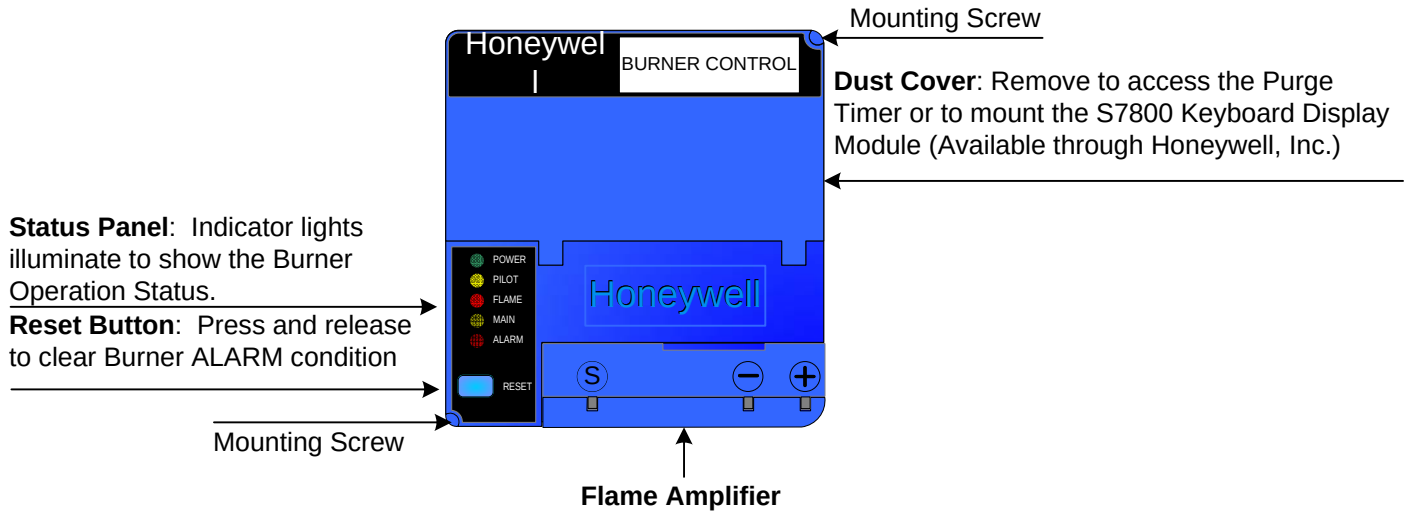


PUREHEAT SAFETY CONTROLS NG/LP BURNER WIRING DIAGRAM



PUREHEAT SAFETY CONTROLS

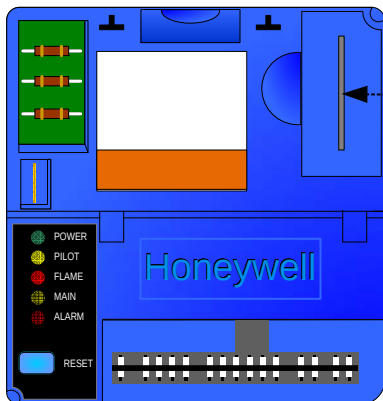
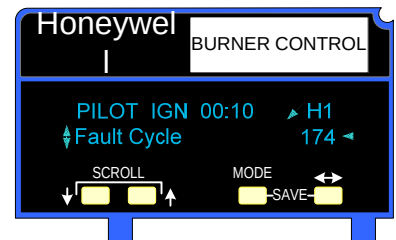
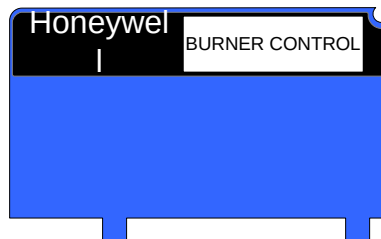
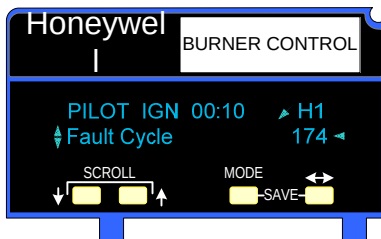
BURNER CONTROL OVERVIEW



Flame Amplifier (*p/n P100-368): Boosts the signal from the Ultra Violet (UV) Flame Detector, the Flame Detector monitors the Pilot Flame and allows Main Gas Valve operation provided the Pilot Flame remains stable. To remove the Flame Amplifier, carefully pry the Amplifier away from the Main Control using the slot provided.



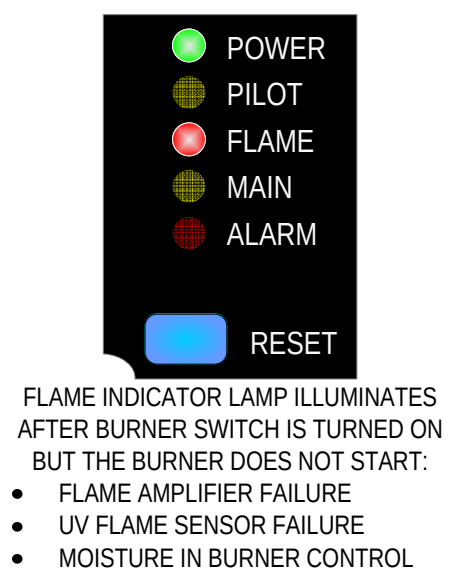
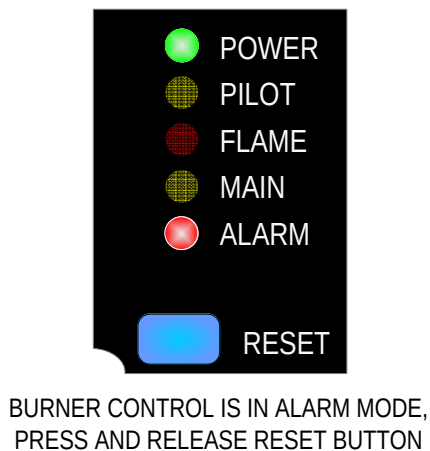
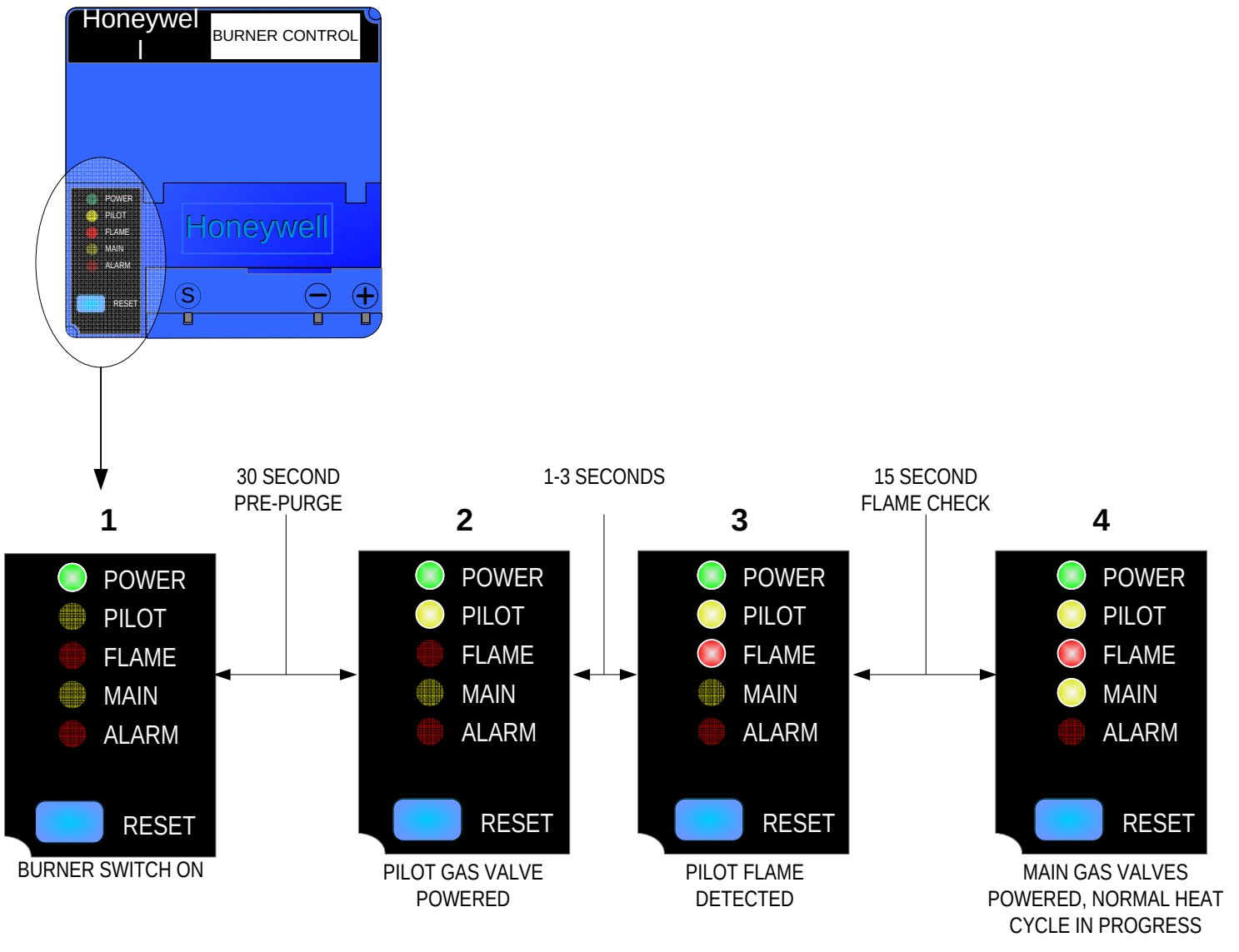
Dust Cover: Removed to access the Purge Timer or to mount the S7800 Keyboard Display Module.



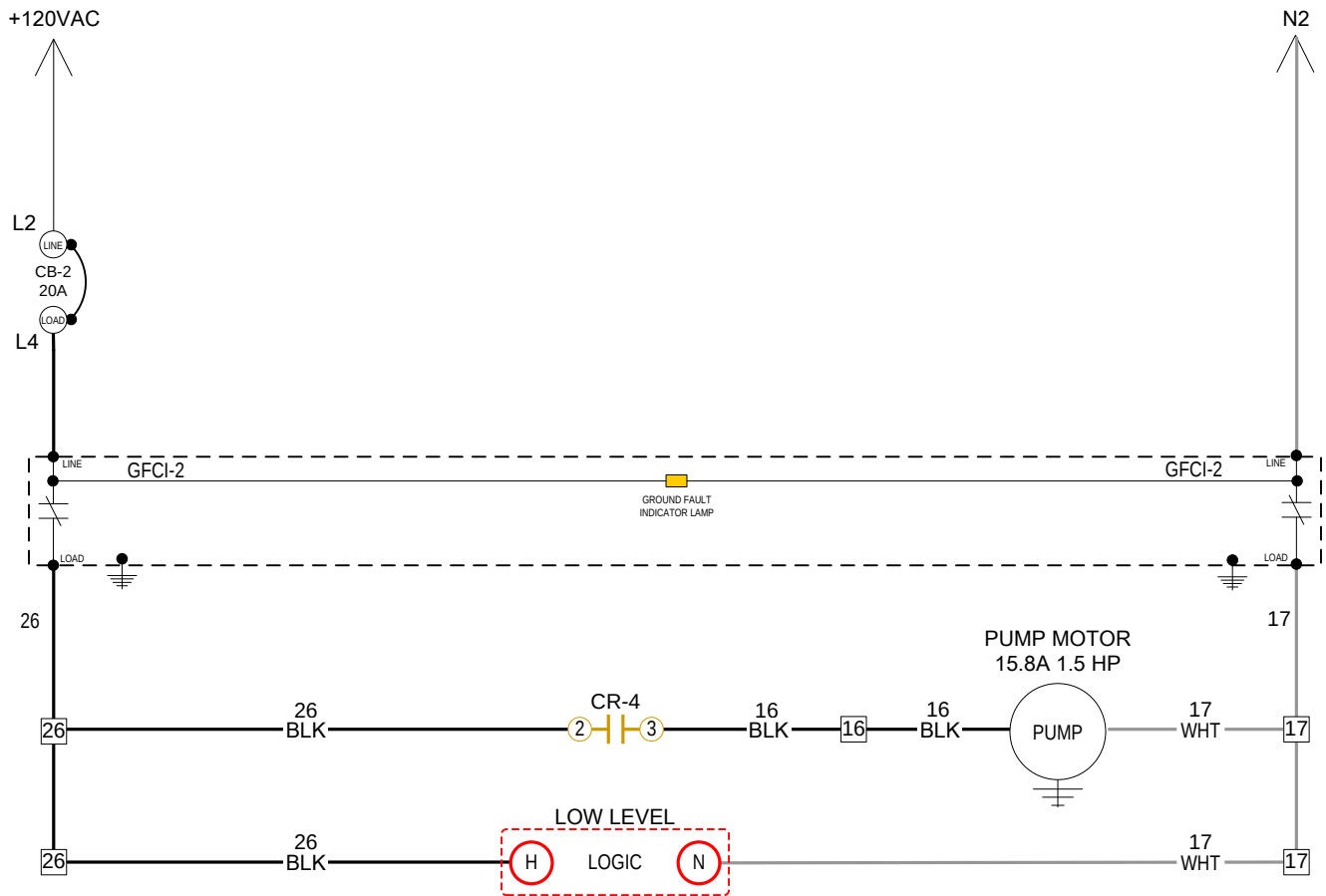
Purge Timer (p/n P100-369):
A fixed 30 second timer for the Pre-Purge cycle of the Burner.

S7800A KEYBOARD DISPLAY MODULE:
The S7800 Keyboard Display Module (shown powered) is a tool to aid in the diagnosis of Burner malfunctions and is available through Honeywell, Inc.

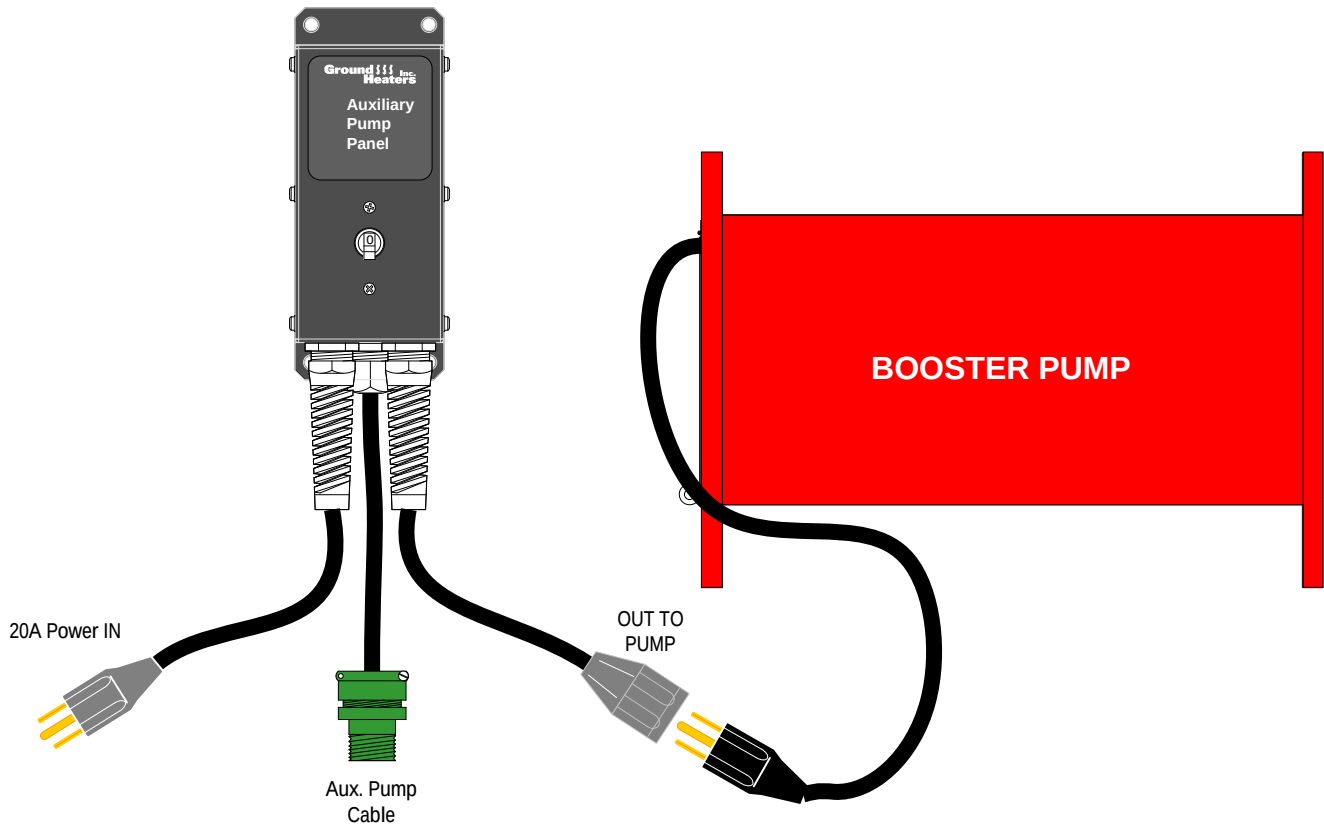
PUREHEAT SAFETY CONTROLS SEQUENCE OF OPERATION



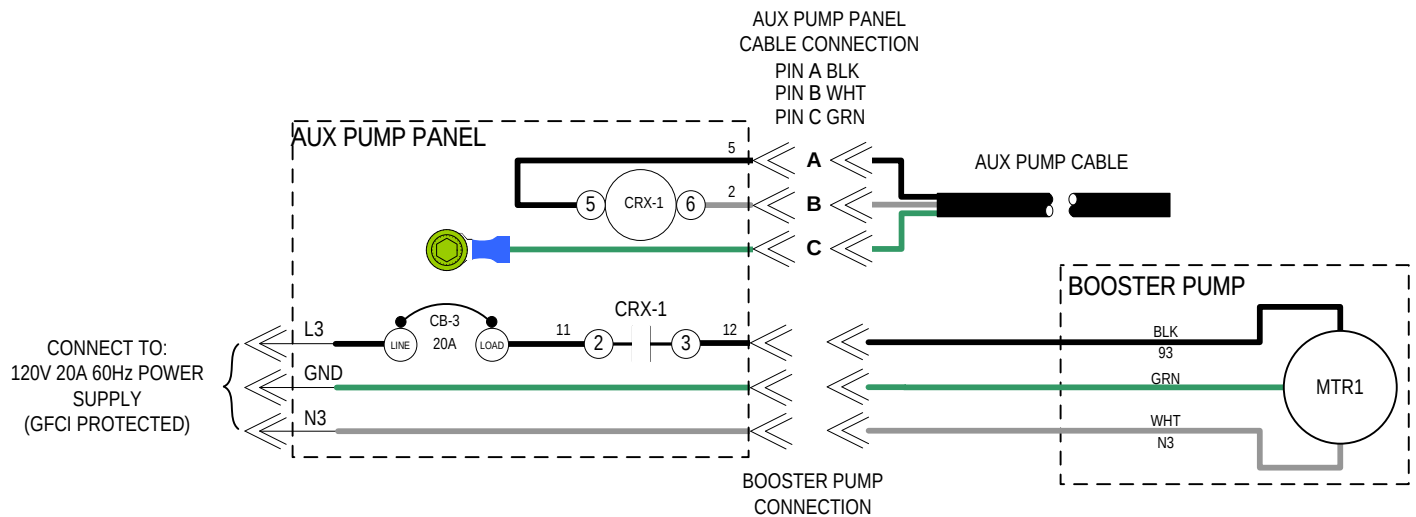
PUREHEAT WIRING SCHEMATIC CIRCUIT 2



PUREHEAT SCHEMATIC – AUXILIARY PUMP PANEL (P/N A109-199)



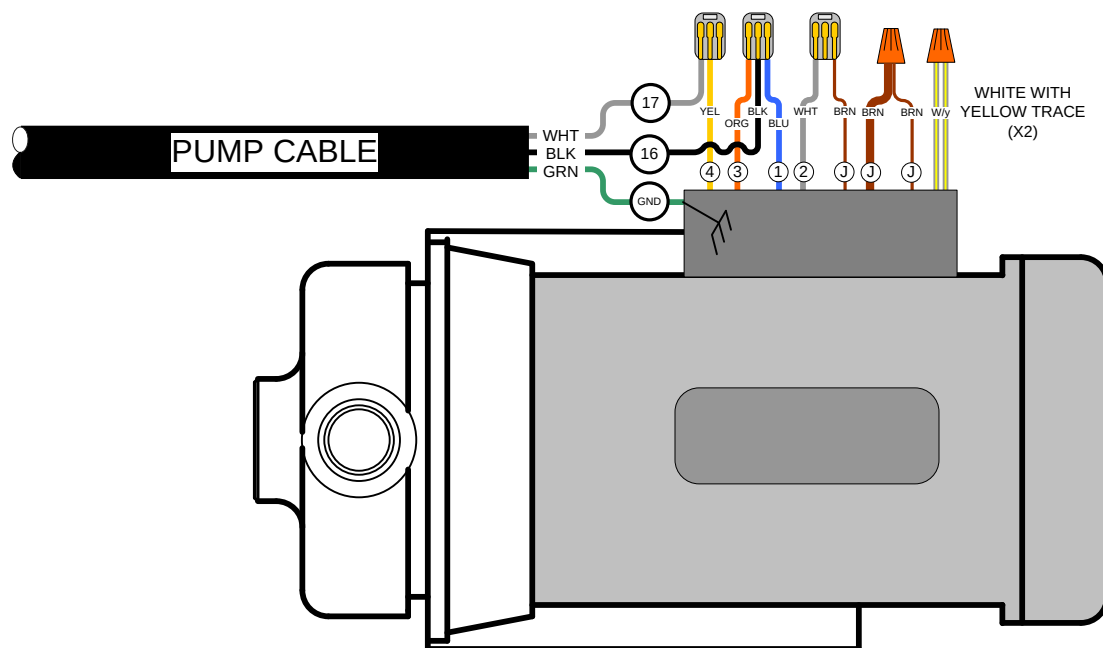
BOOSTER PUMP AND AUXILIARY PUMP PANEL INTERNAL SCHEMATIC



PUREHEAT CIRCULATION - BOOSTER PUMP MOTOR WIRING

WIRE COLORS

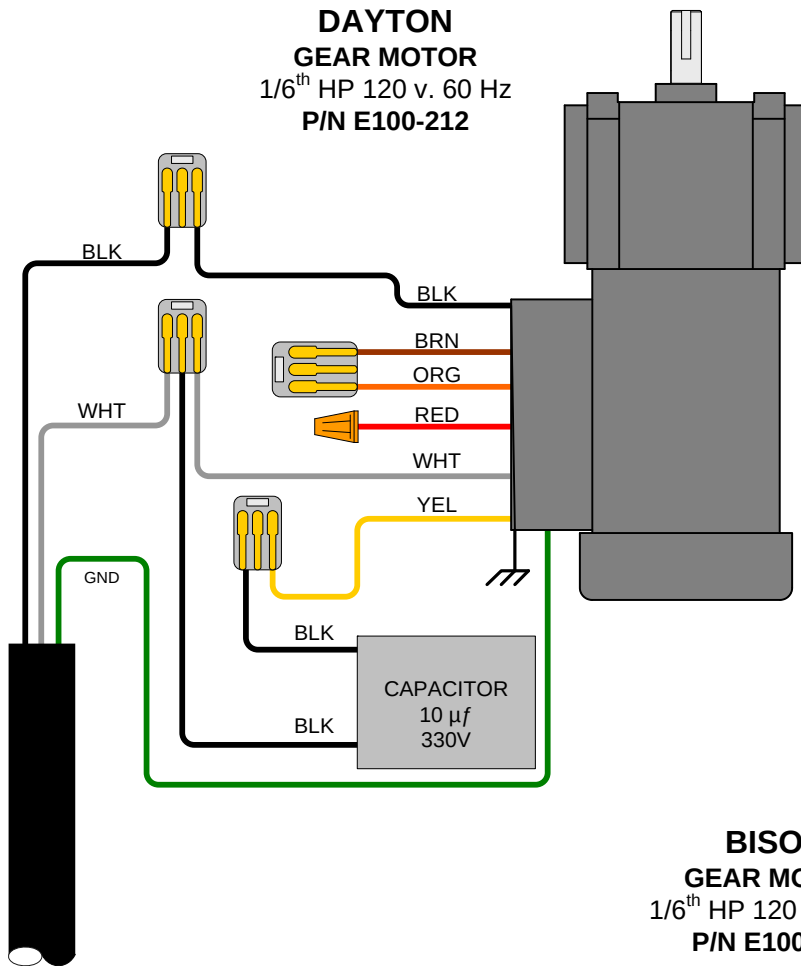
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
YEL	= YELLOW	
W/y	= WHITE W/ YELLOW TRACE	



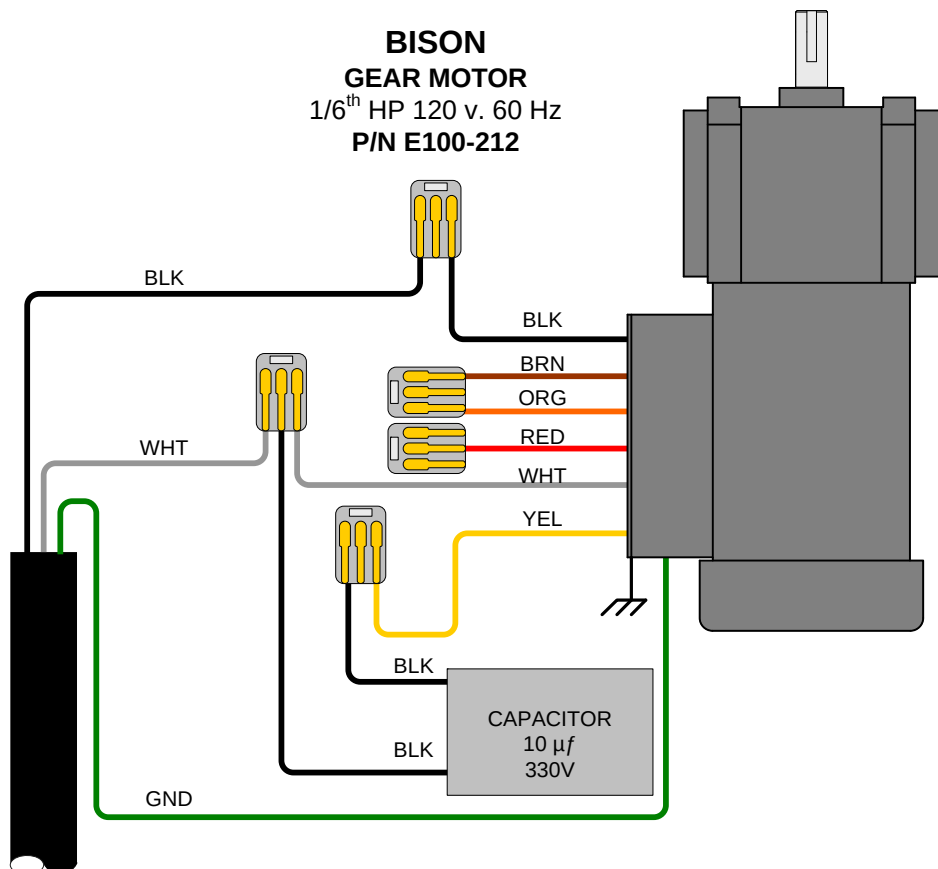
CIRCULATION - BOOSTER PUMP ASSY.
1.5 HP 15.8 FLA 18.8 SFA
P/N M100-647

PUREHEAT REWIND MOTOR WIRING

**DAYTON
GEAR MOTOR**
1/6th HP 120 v. 60 Hz
P/N E100-212

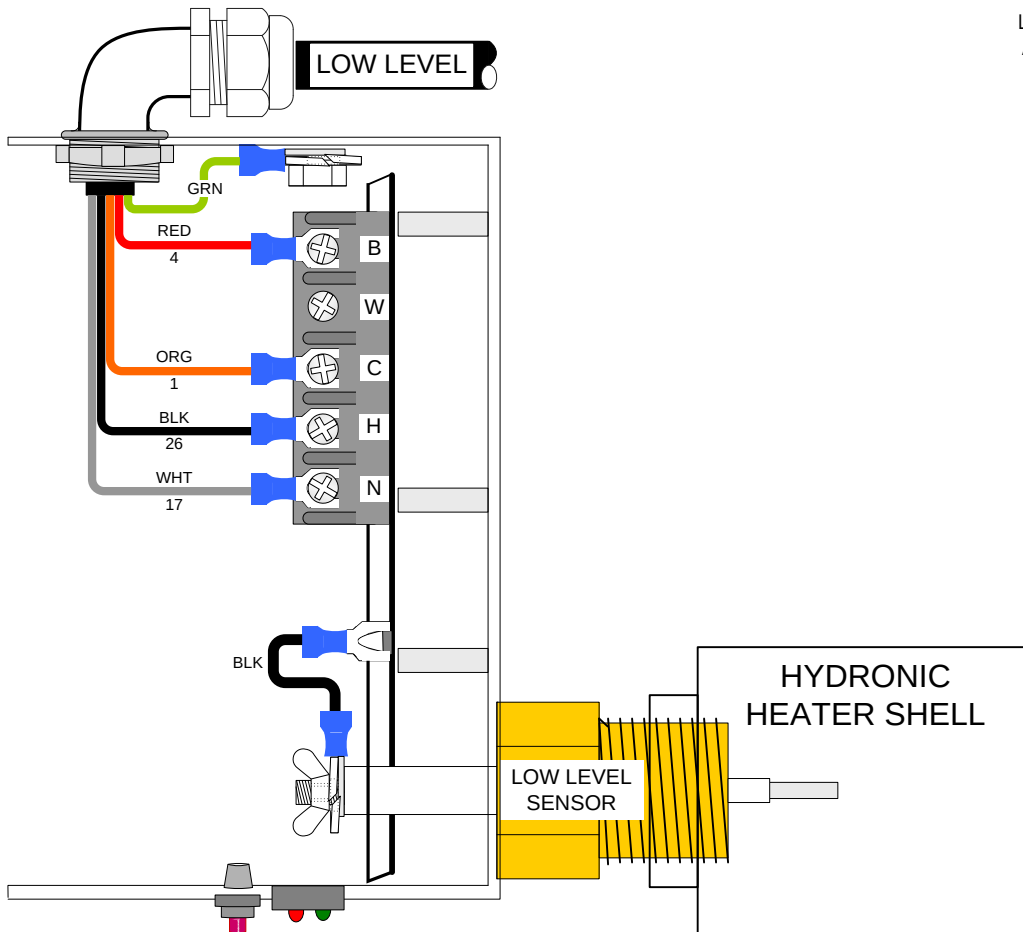


**BISON
GEAR MOTOR**
1/6th HP 120 v. 60 Hz
P/N E100-212

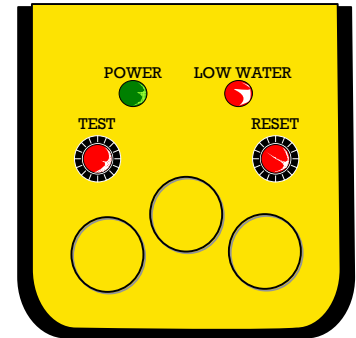


PUREHEAT SAFETY CONTROLS LOW LEVEL SHUTDOWN DEVICE (P/N E100-198)

NOTE: CONTROL IS SHOWN IN A NON-POWERED STATE

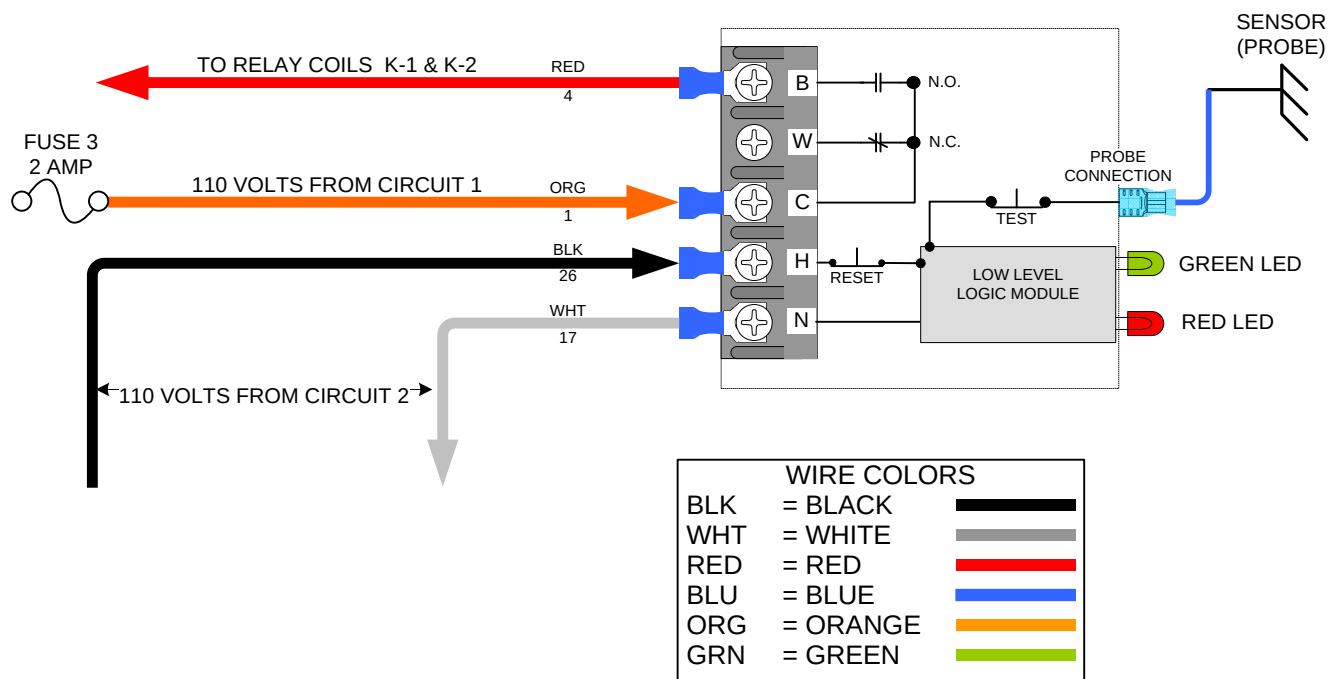


LOW LEVEL SHUTDOWN DEVICE CONTROLS
AND INDICATOR LIGHTS LOCATION ON THE
BOTTOM OF THE DEVICE.

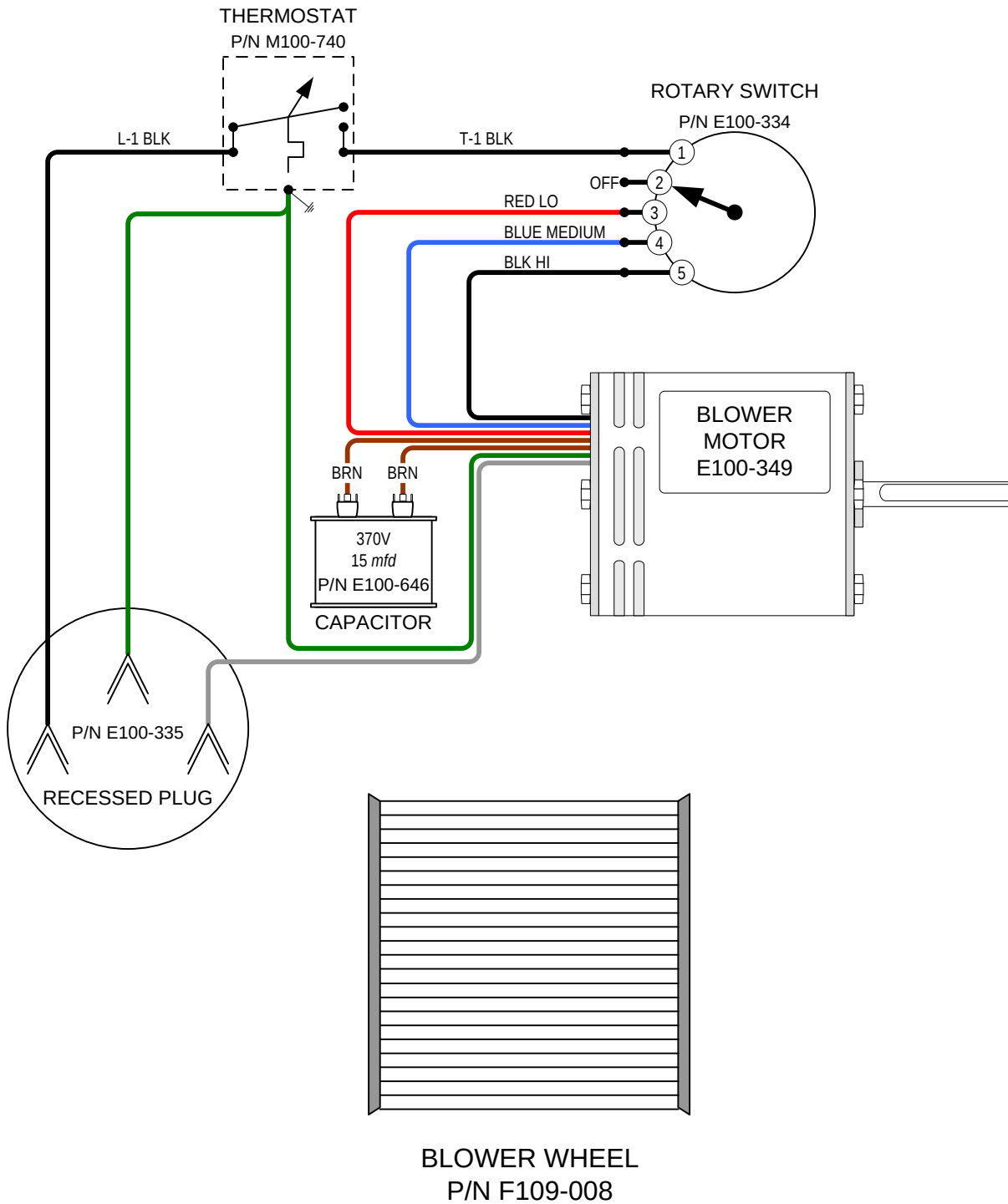


REFER TO SECTION
5.2.1.2 FOR
DETAILED TESTING
INSTRUCTIONS

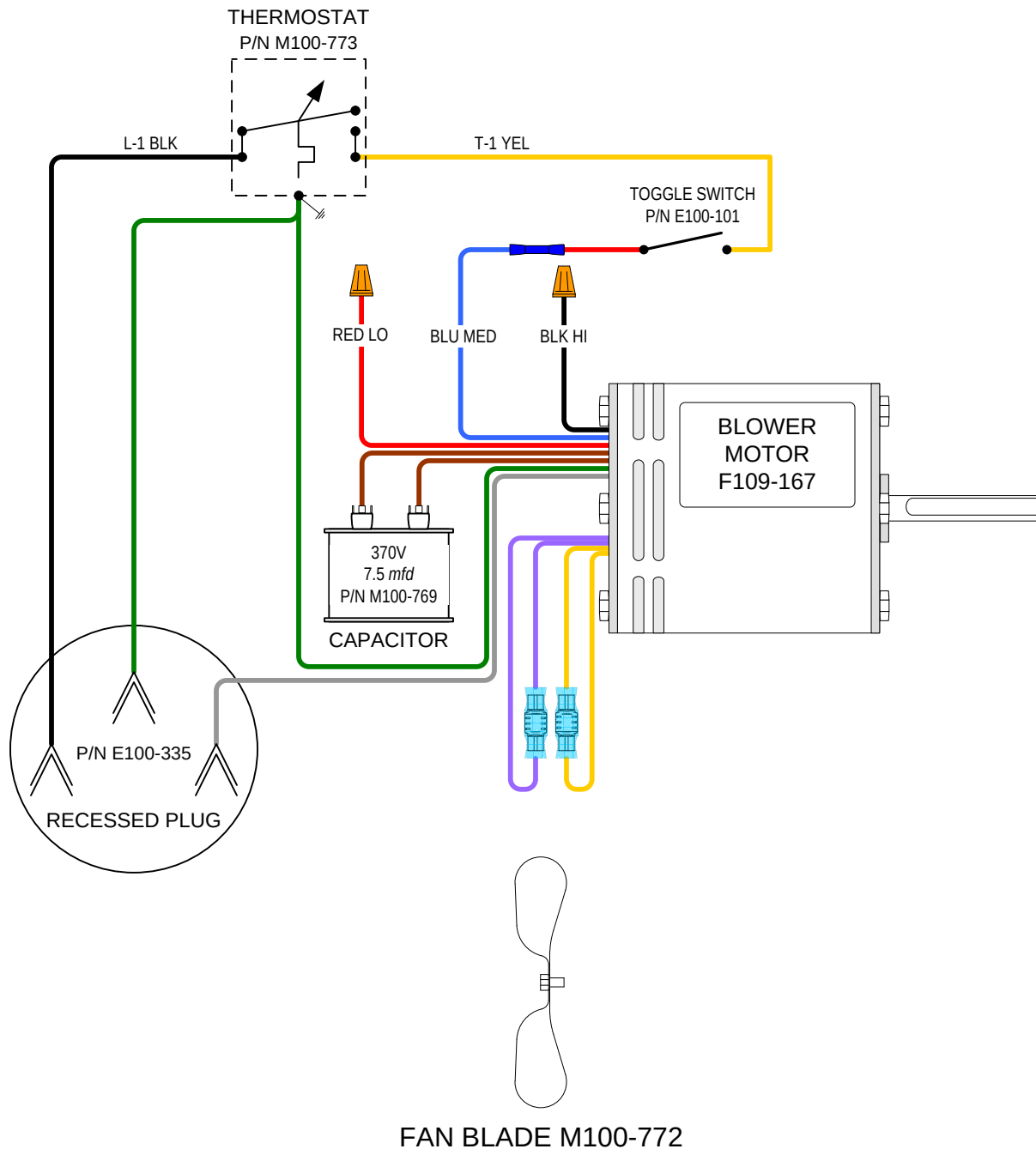
LOW LEVEL DEVICE INTERNAL SCHEMATIC



HX200 HEAT XCHANGER™ WIRING DIAGRAM

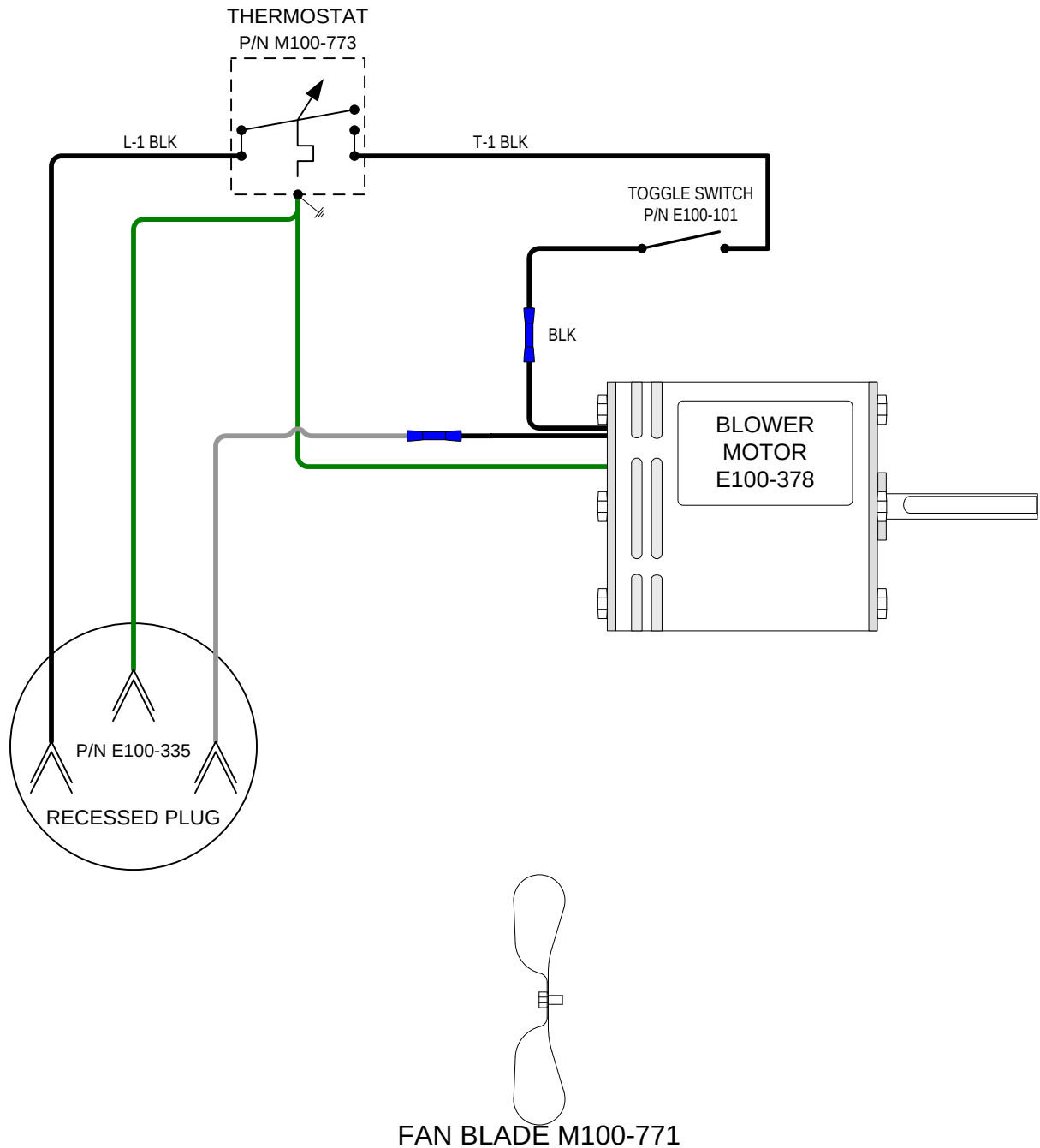


HX100 HEAT XCHANGER™ WIRING DIAGRAM



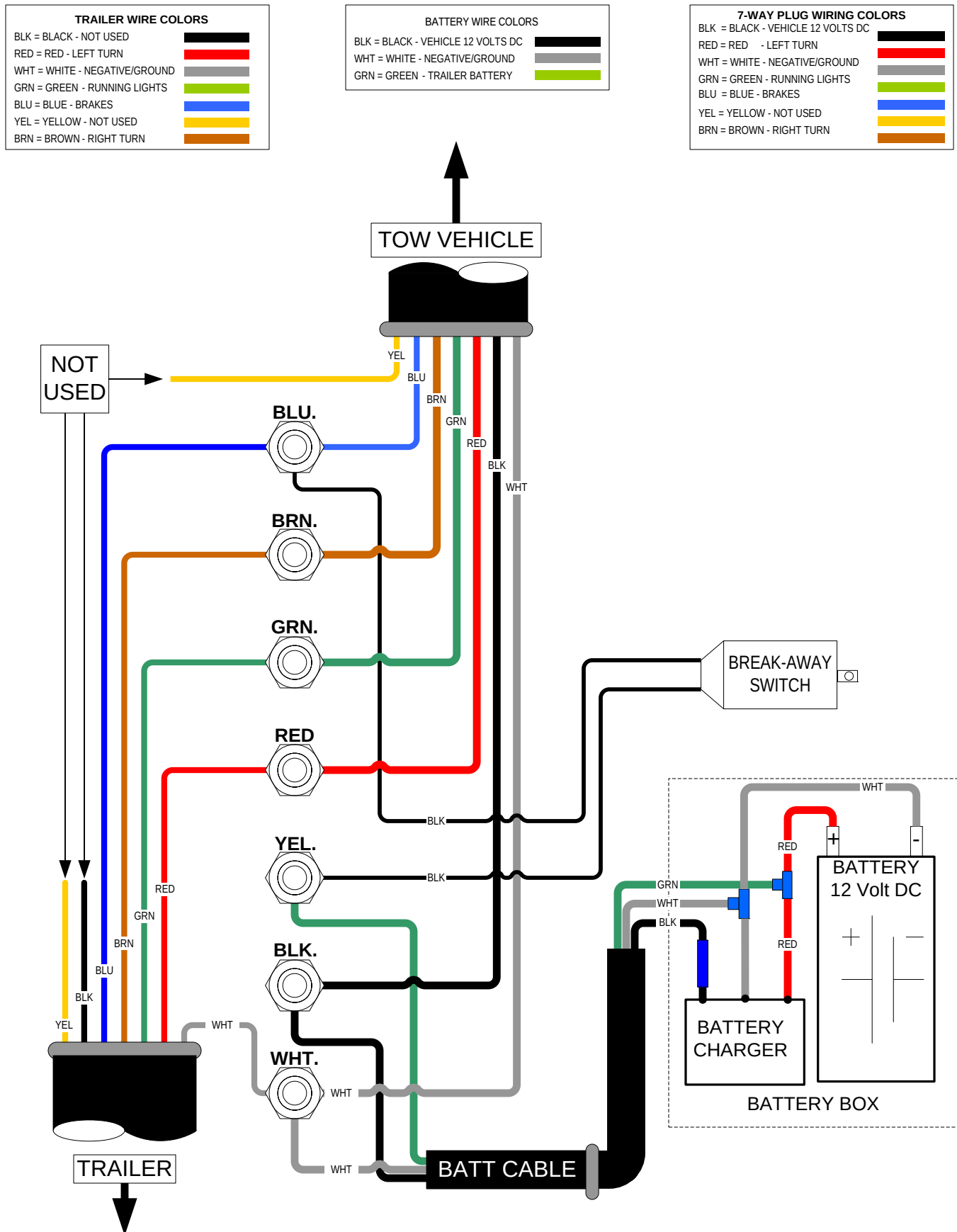
WIRE COLORS		
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
BRN	= BROWN	
YEL	= YELLOW	
PURP	= PURPLE	

HX50 HEAT XCHANGER™ WIRING DIAGRAM



WIRE COLORS		
BLK	= BLACK	
RED	= RED	
WHT	= WHITE	
GRN	= GREEN	
BLU	= BLUE	
BRN	= BROWN	

PUREHEAT TRAILER JUNCTION BOX AND BATTERY WIRING

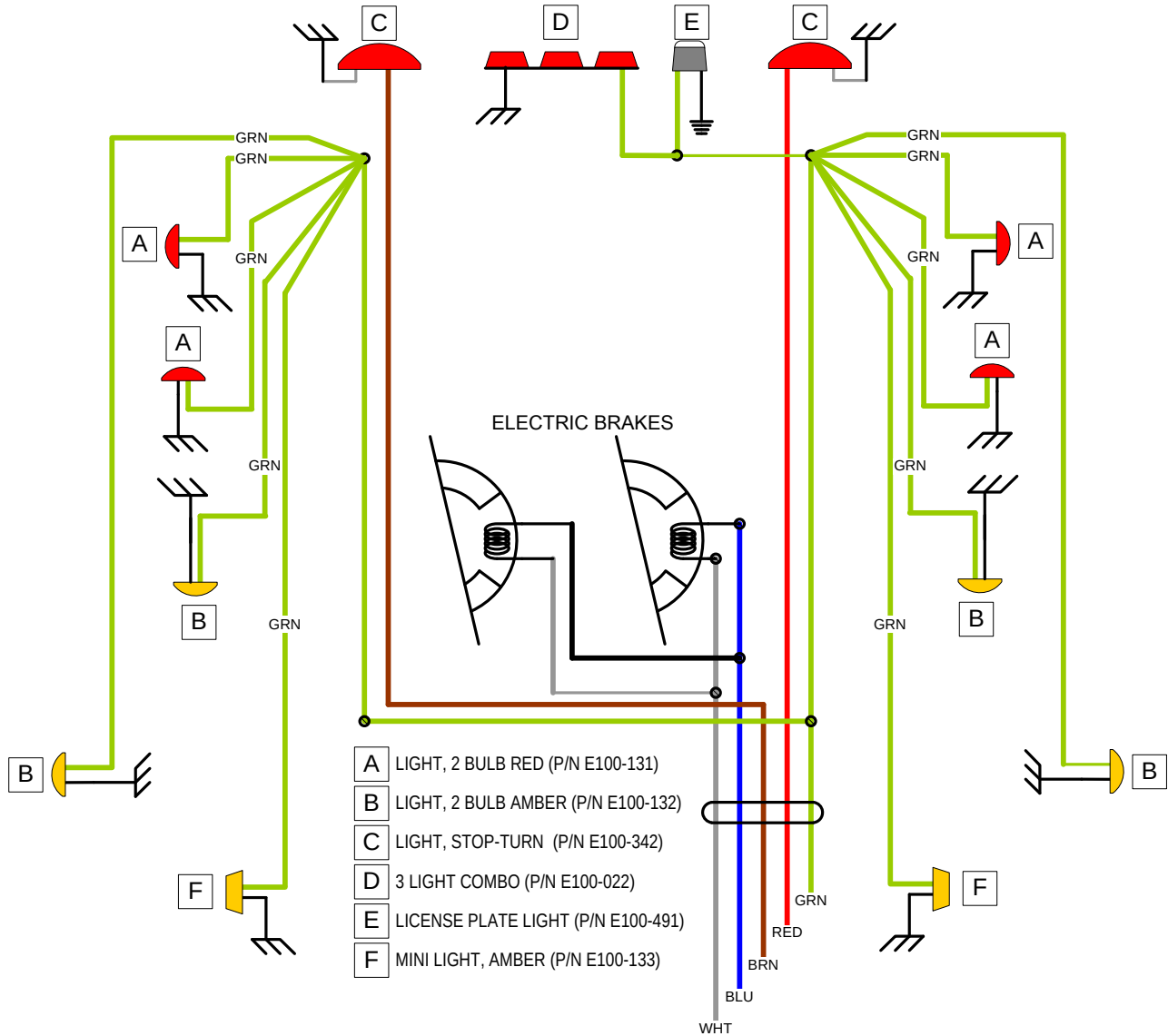


PUREHEAT TRAILER WIRING

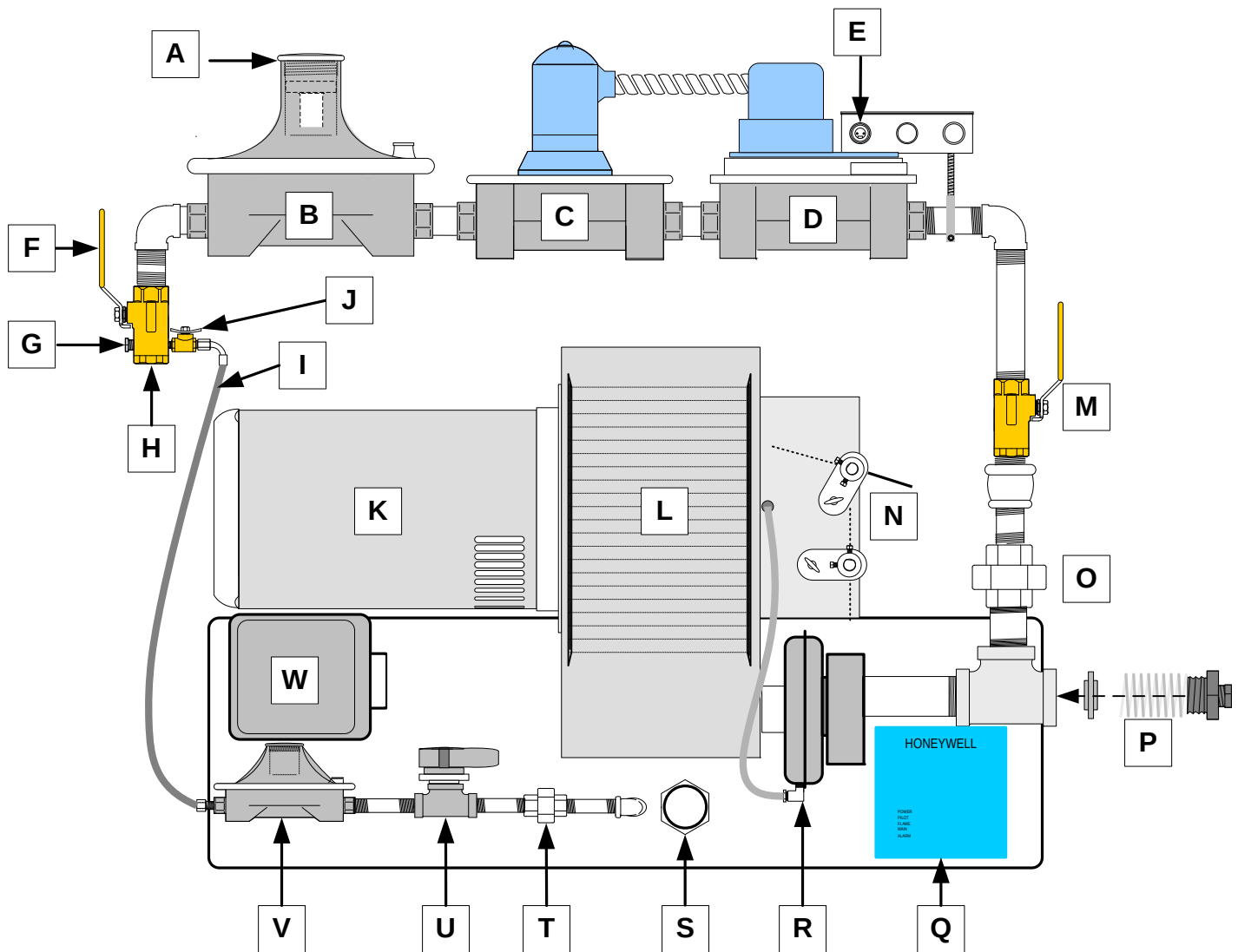
7-WAY PLUG WIRING COLORS	
BLK = BLACK - VEHICLE 12 VOLTS DC	
RED = RED - LEFT TURN	
WHT = WHITE - NEGATIVE/GROUND	
GRN = GREEN - RUNNING LIGHTS	
BLU = BLUE - BRAKES	
YEL = YELLOW - NOT USED	
BRN = BROWN - RIGHT TURN	

BATTERY WIRE COLORS	
BLK = BLACK - VEHICLE 12 VOLTS DC	
WHT = WHITE - NEGATIVE/GROUND	
GRN = GREEN - TRAILER BATTERY	

TRAILER WIRE COLORS	
BLK = BLACK - NOT USED	
RED = RED - LEFT TURN	
WHT = WHITE - NEGATIVE/GROUND	
GRN = GREEN - RUNNING LIGHTS	
BLU = BLUE - BRAKES	
YEL = YELLOW - NOT USED	
BRN = BROWN - RIGHT TURN	



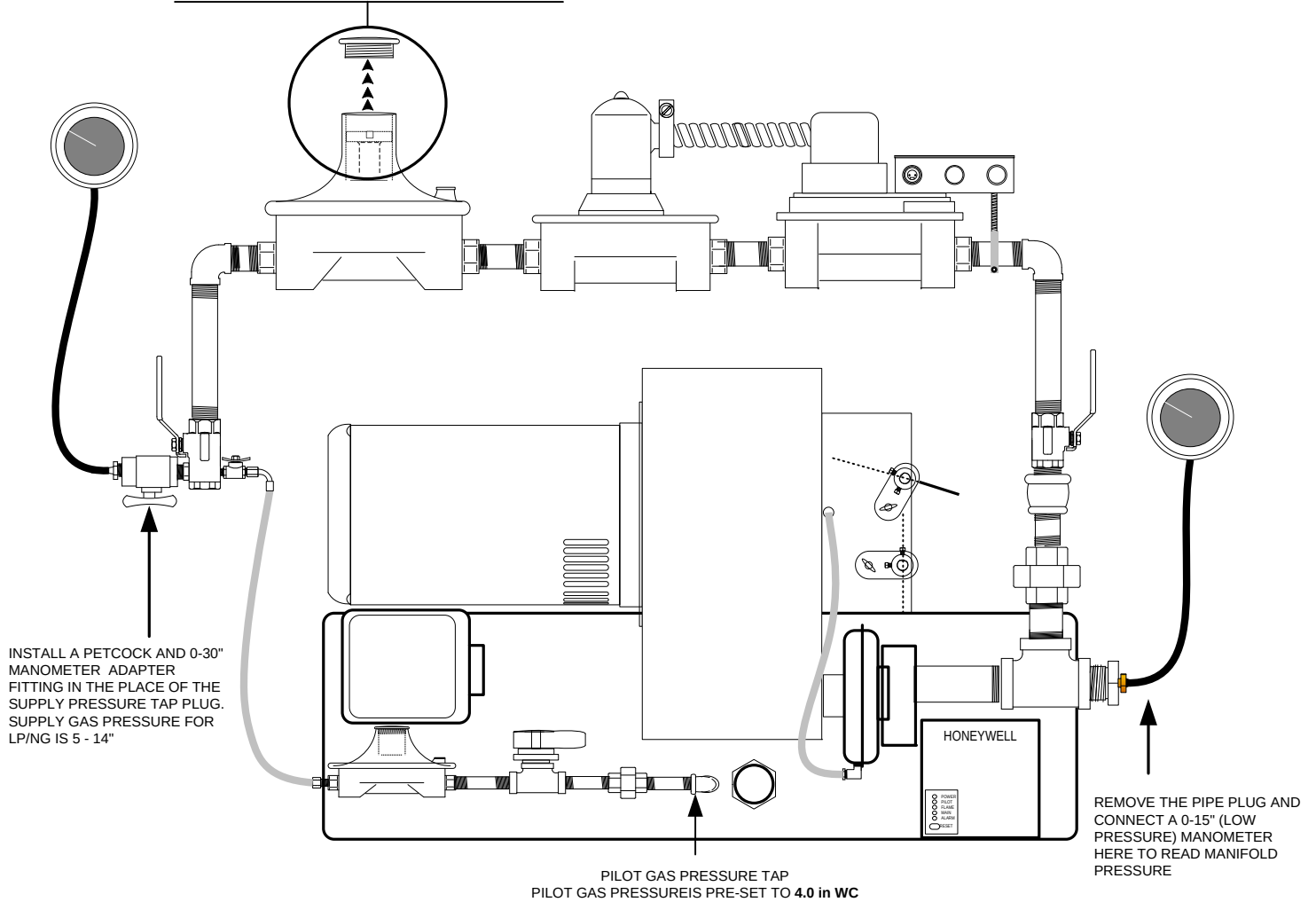
PUREHEAT NG/LP BURNER COMPONENT IDENTIFICATION (P/N P100-673)



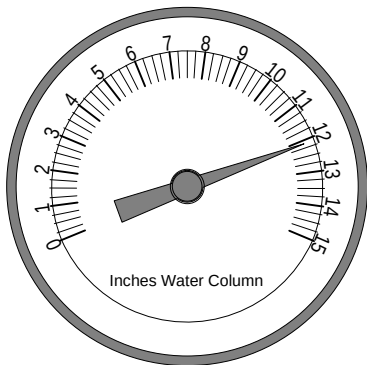
- | | |
|--|--|
| [A] REGULATOR DUST CAP | [L] BURNER BLOWER WHEEL (P/N P100-334) |
| [B] MANIFOLD GAS PRESSURE REGULATOR (P/N P100-342) | [M] MANIFOLD GAS SHUT-OFF VALVE |
| [C] MAIN GAS VALVE (P/N P100-340) | [N] AIR DAMPERS |
| [D] AUX GAS VALVE (P/N P100-341) | [O] GAS TRAIN UNION |
| [E] 1/16" MALE PIN PLUG (P/N100-341) | [P] PRESSURE TEST PORT w/ 9/16" ORIFICE & SPRING |
| [F] GAS SUPPLY INLET VALVE | [Q] BURNER CONTROL (P/N P100-338) |
| [G] GAS SUPPLY PRESSURE TEST PORT | [R] AIR PROVING PRESSURE SWITCH (P/N P100-335) |
| [H] MAIN GAS SUPPLY CONNECTION POINT | [S] I.R. PILOT FLAME SENSOR (P/N P100-354) |
| [I] PILOT GAS LINE (P/N F100-130) | [T] PILOT GAS TRAIN UNION |
| [J] PILOT GAS SUPPLY VALVE | [U] PILOT GAS VALVE (P/N P100-353) |
| [K] BURNER BLOWER MOTOR (P/N P100-333) | [V] PILOT GAS REGULATOR (P/N P100-336) |

PUREHEAT NG/LP BURNER (P/N P100-673) GAS PRESSURE CHECKING AND ADJUSTING

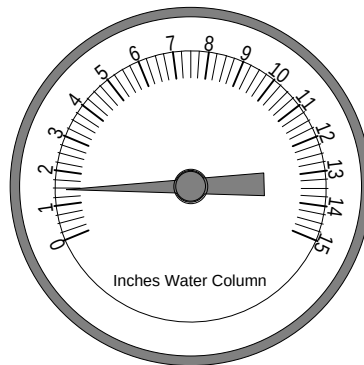
REMOVE THE GAS REGULATOR ADJUSTMENT COVER.
INSERT A SCREWDRIVER INTO THE ADJUSTMENT STEM.
TURN CLOCKWISE TO INCREASE PRESSURE.
TURN COUNTER CLOCKWISE TO DECREASE PRESSURE.



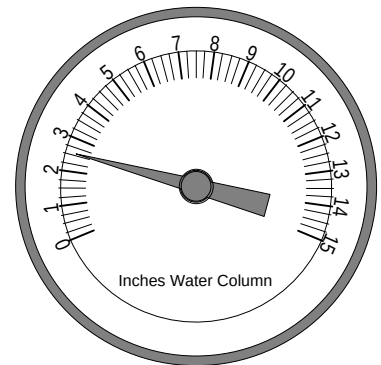
USE A MANOMETER TO MEASURE GAS PRESSURE



GAS SUPPLY PRESSURE
5 in WC MINIMUM
14 in WC MAXIMUM



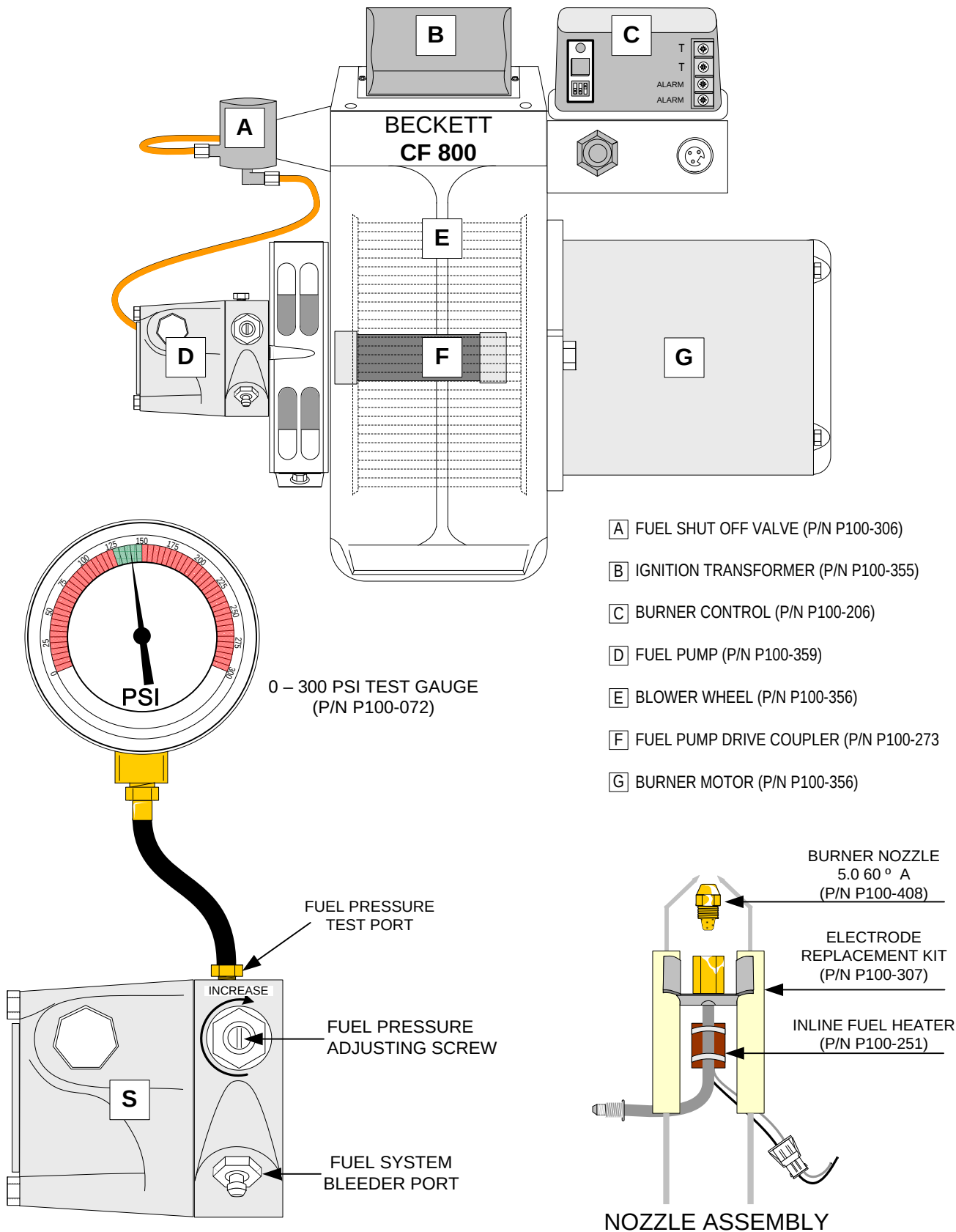
LP 1.4-1.6 in. WC MAX



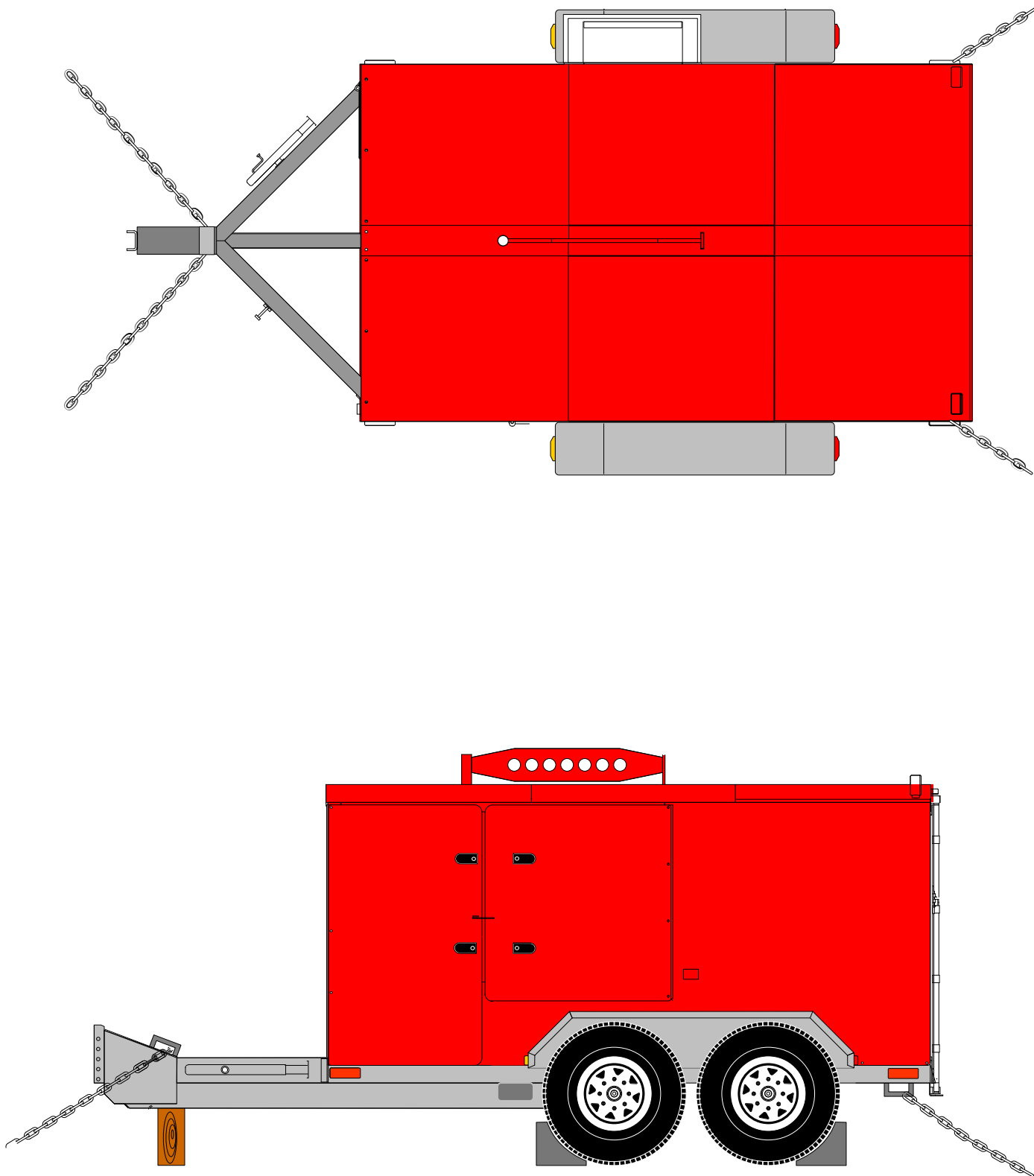
NG 2.5-3.0 in. WC MAX

GAS MANIFOLD PRESSURE

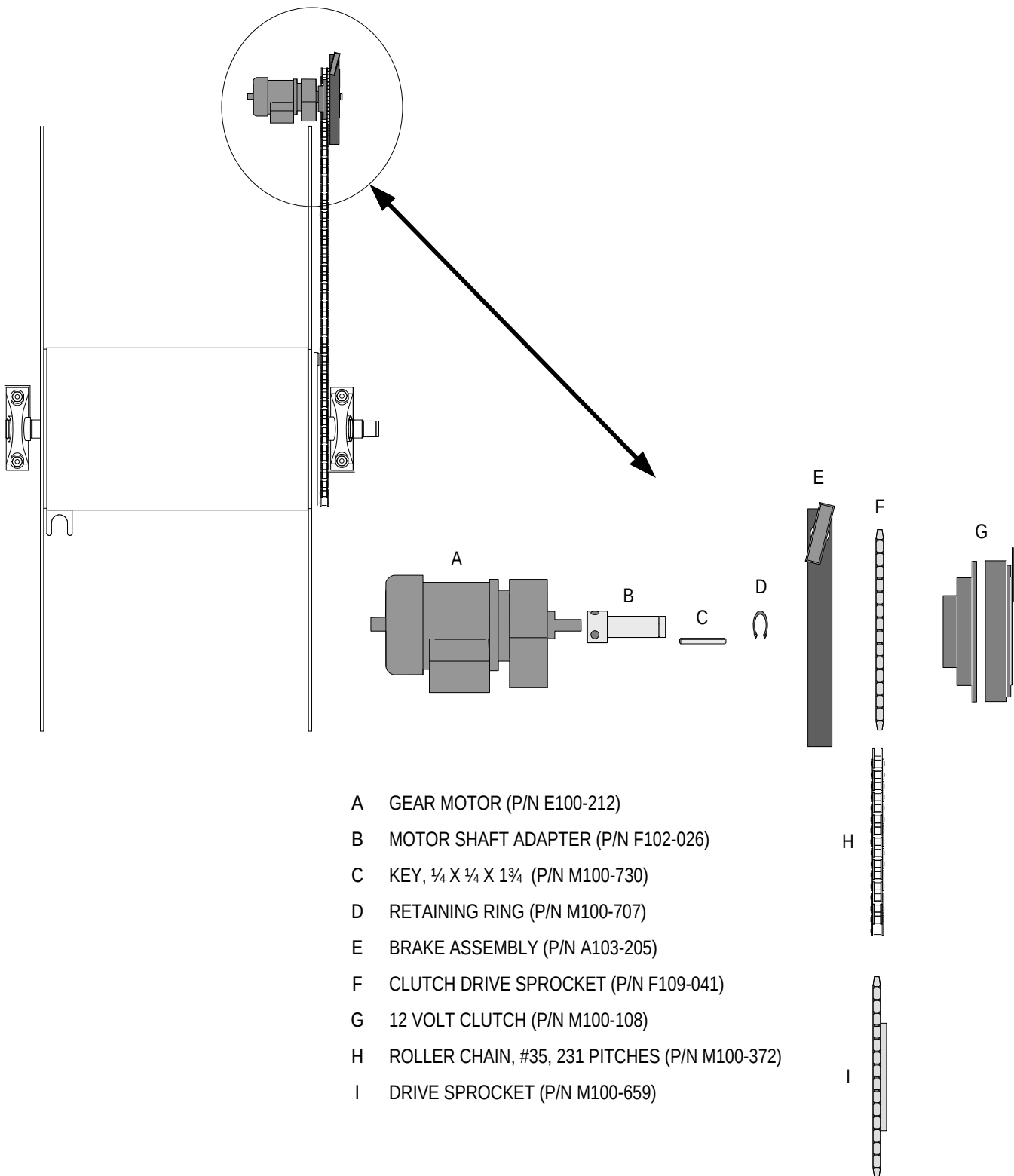
PUREHEAT DIESEL BURNER COMPONENT IDENTIFICATION (P/N P100-690)



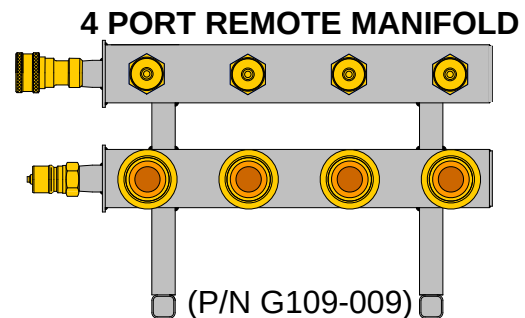
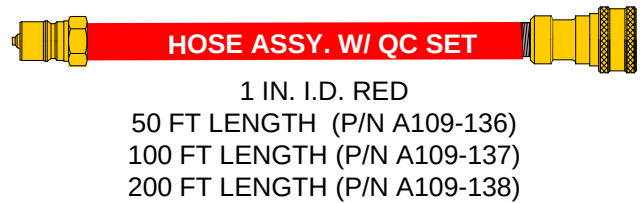
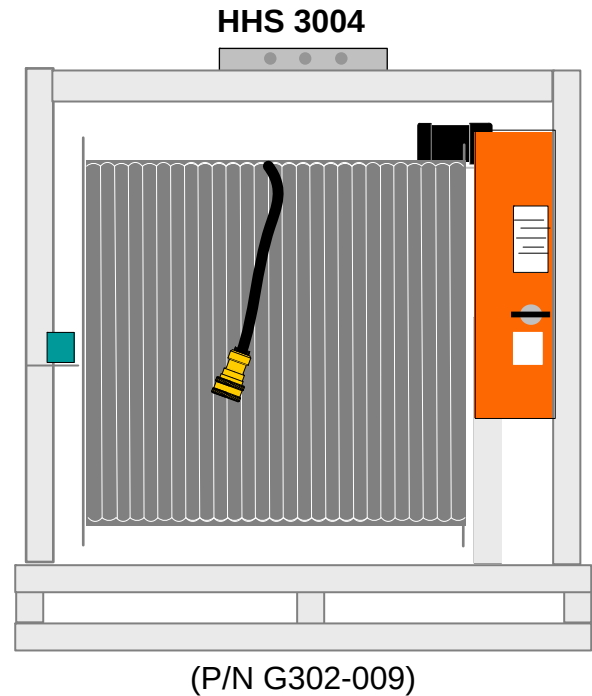
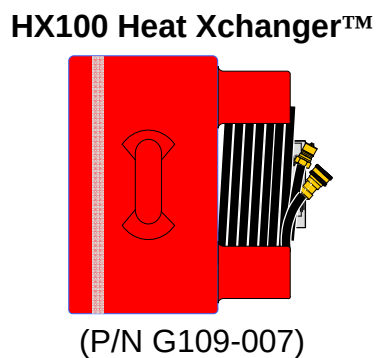
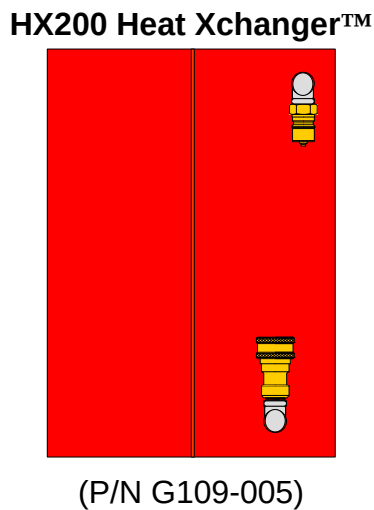
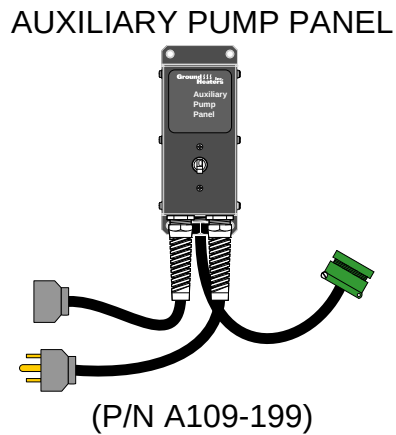
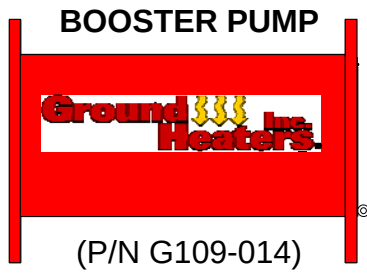
SUGGESTED METHOD FOR SECURING THE PUREHEAT ONTO A TRUCK BED



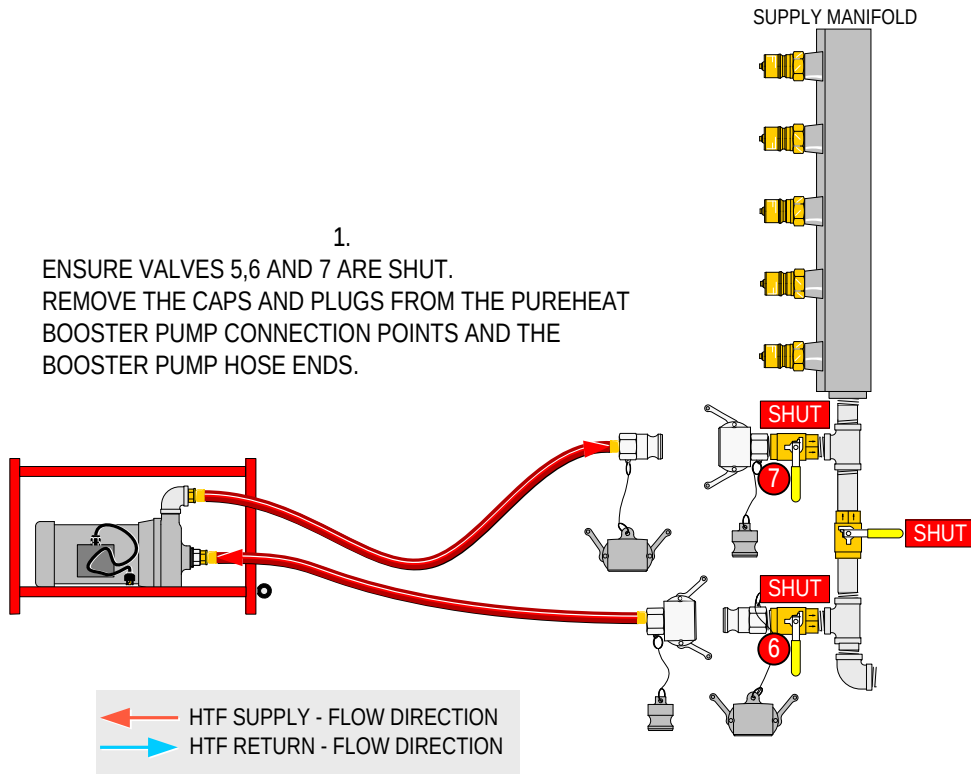
PUREHEAT HOSE REWIND PARTS IDENTIFICATION



PUREHEAT AIR AND SURFACE HEATING ACCESSORIES

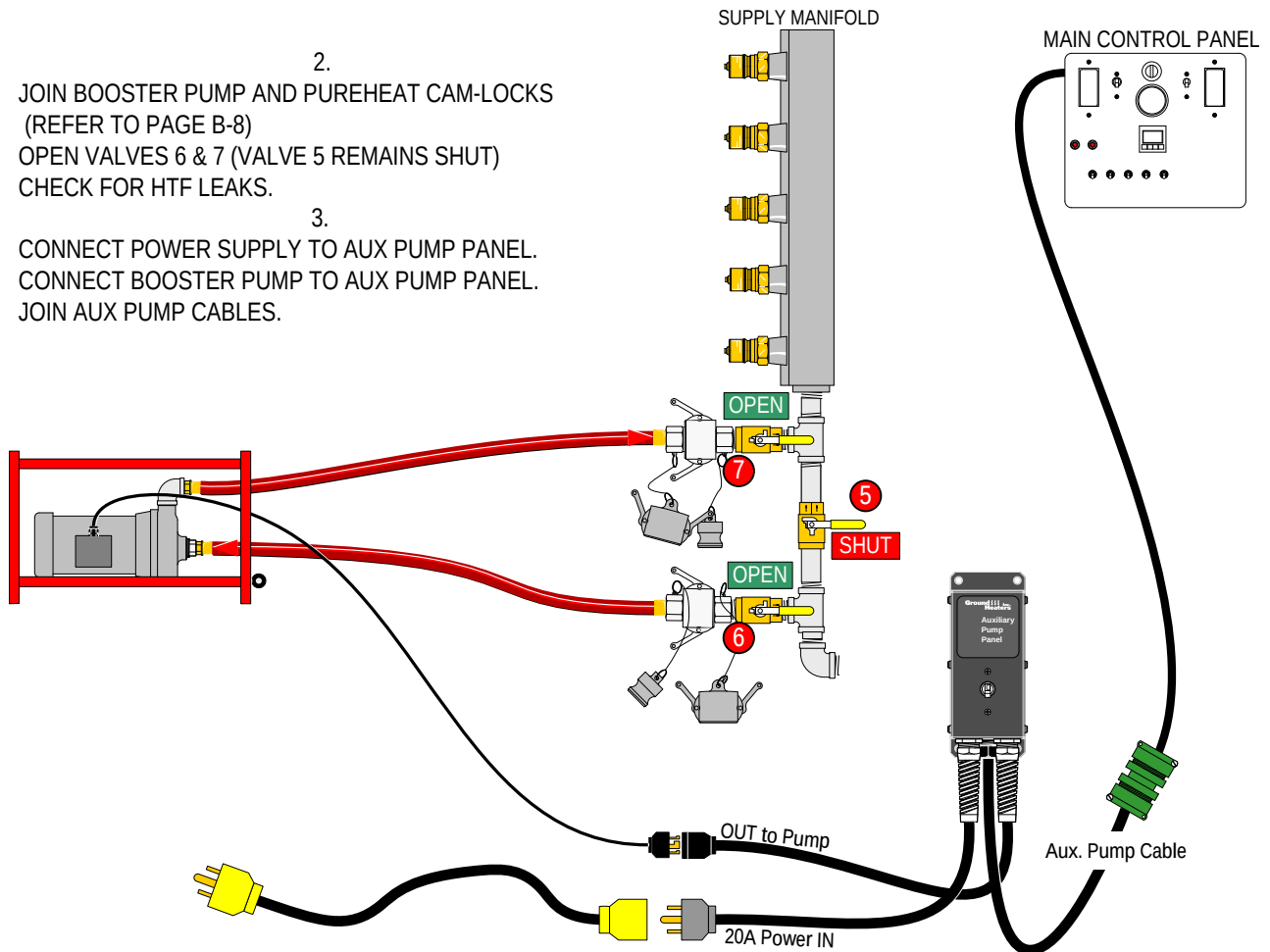


BOOSTER PUMP TO PUREHEAT CONNECTING

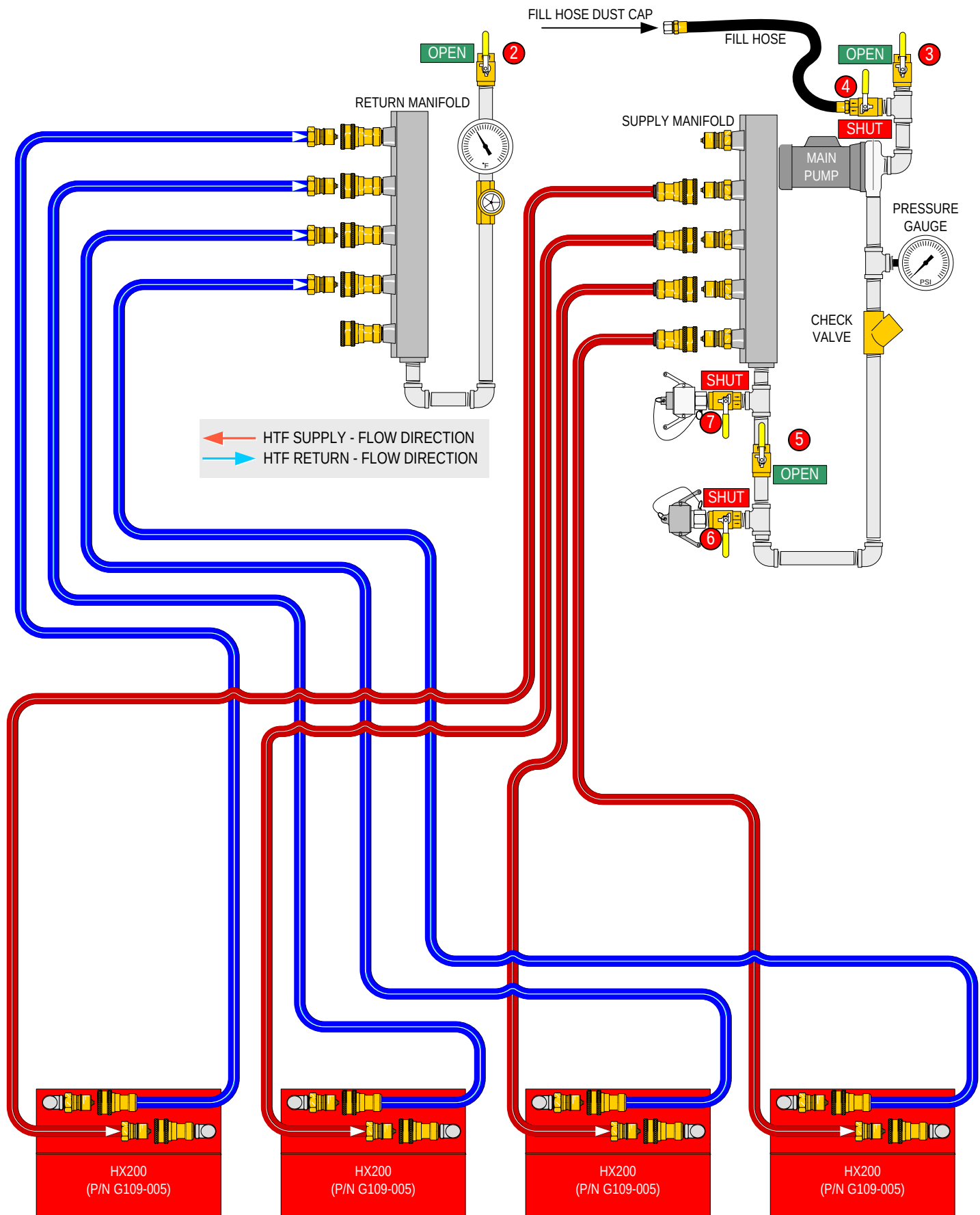


2.
JOIN BOOSTER PUMP AND PUREHEAT CAM-LOCKS
(REFER TO PAGE B-8)
OPEN VALVES 6 & 7 (VALVE 5 REMAINS SHUT)
CHECK FOR HTF LEAKS.

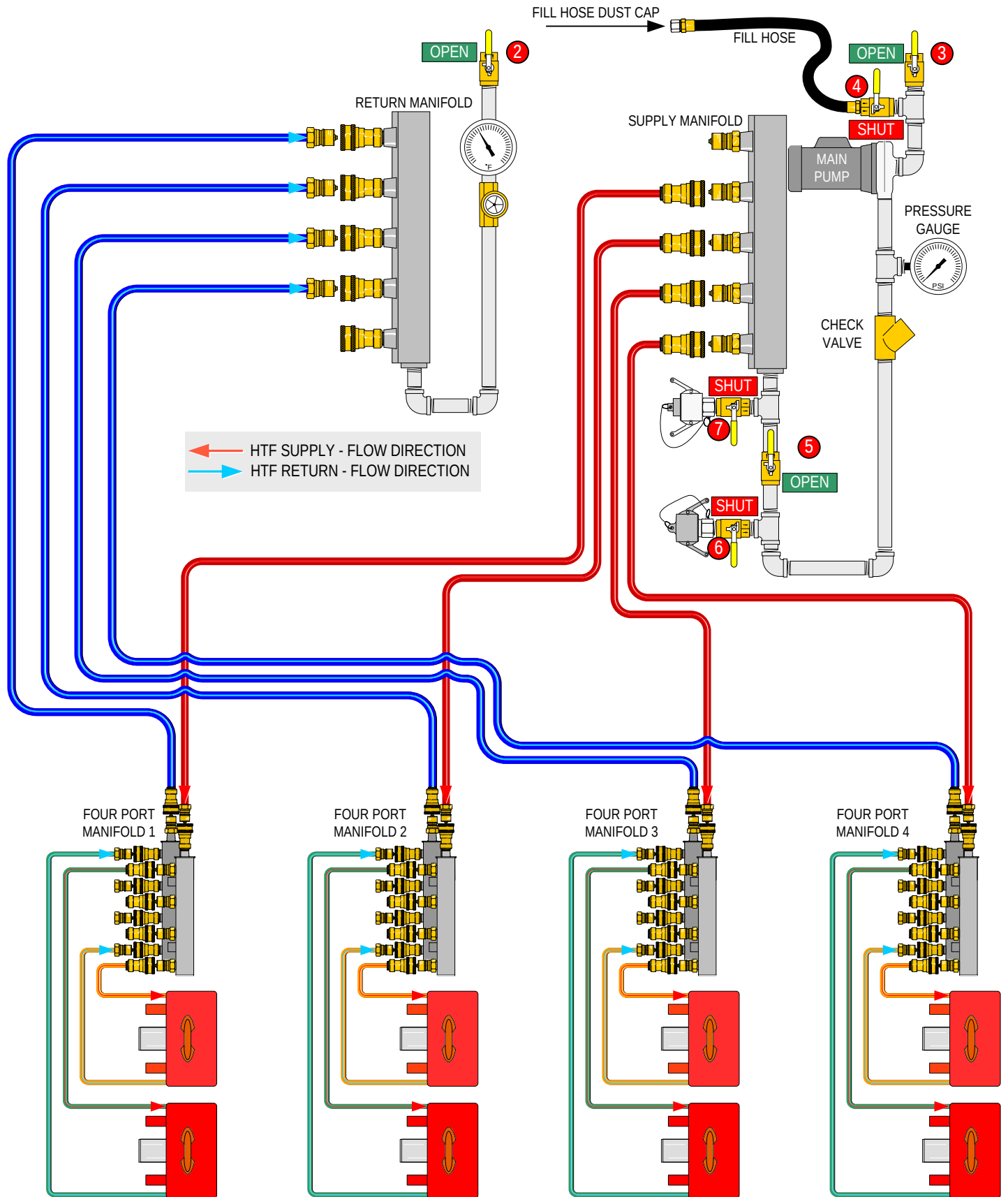
3.
CONNECT POWER SUPPLY TO AUX PUMP PANEL.
CONNECT BOOSTER PUMP TO AUX PUMP PANEL.
JOIN AUX PUMP CABLES.



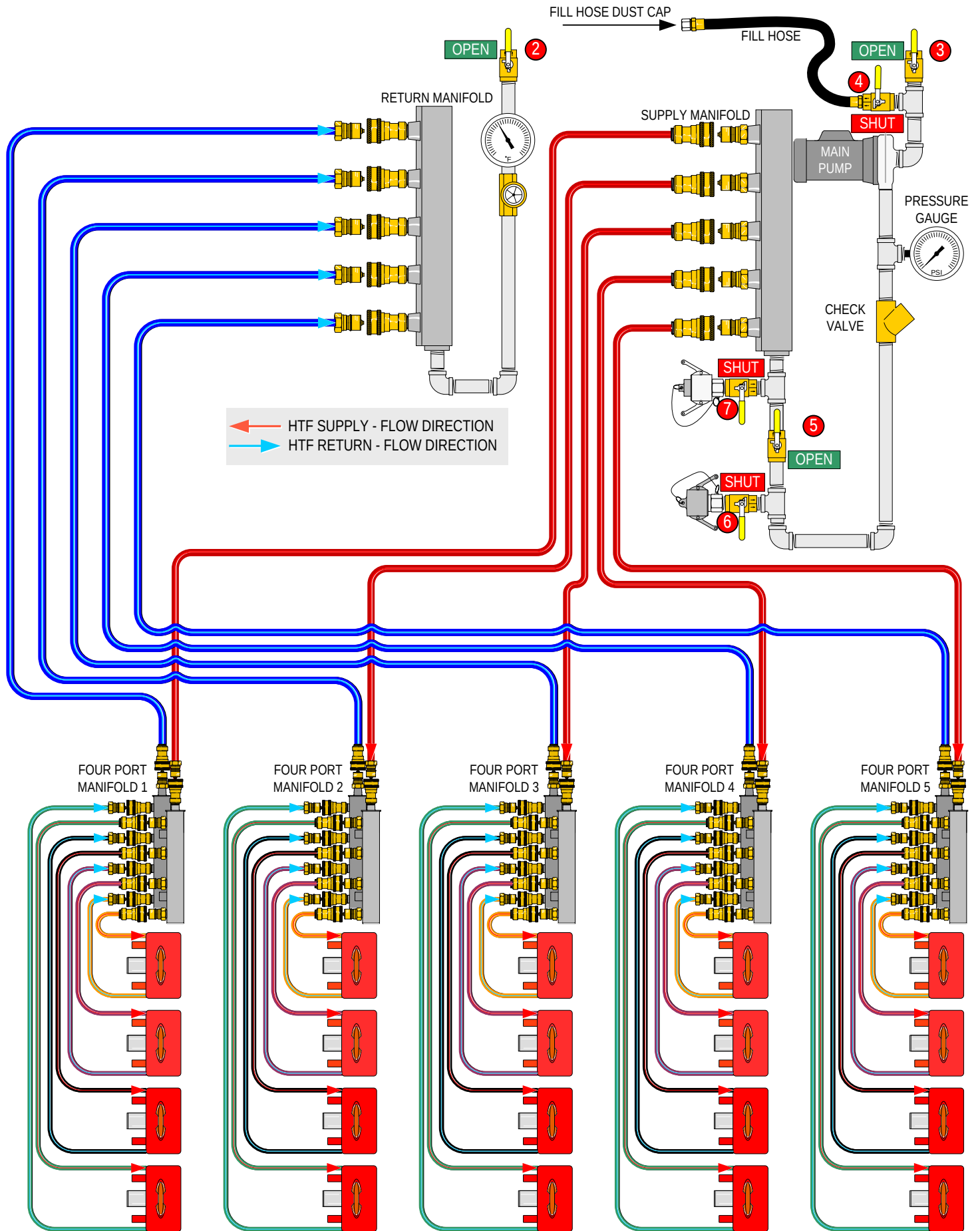
HX200 HEAT XCHANGER™ TO PUREHEAT CONNECTION LAYOUT



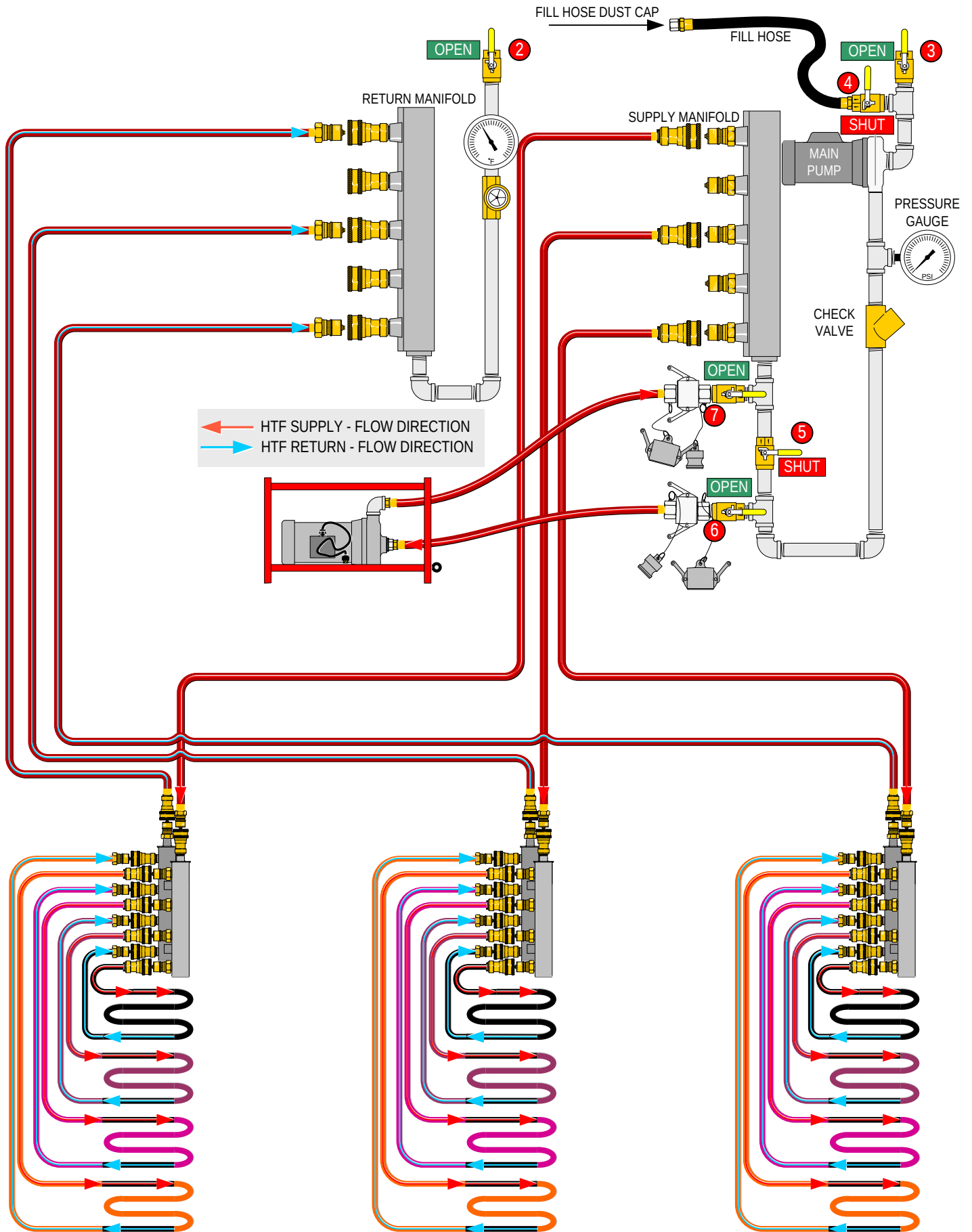
HX100 HEAT XCHANGER™ TO PUREHEAT CONNECTION LAYOUT



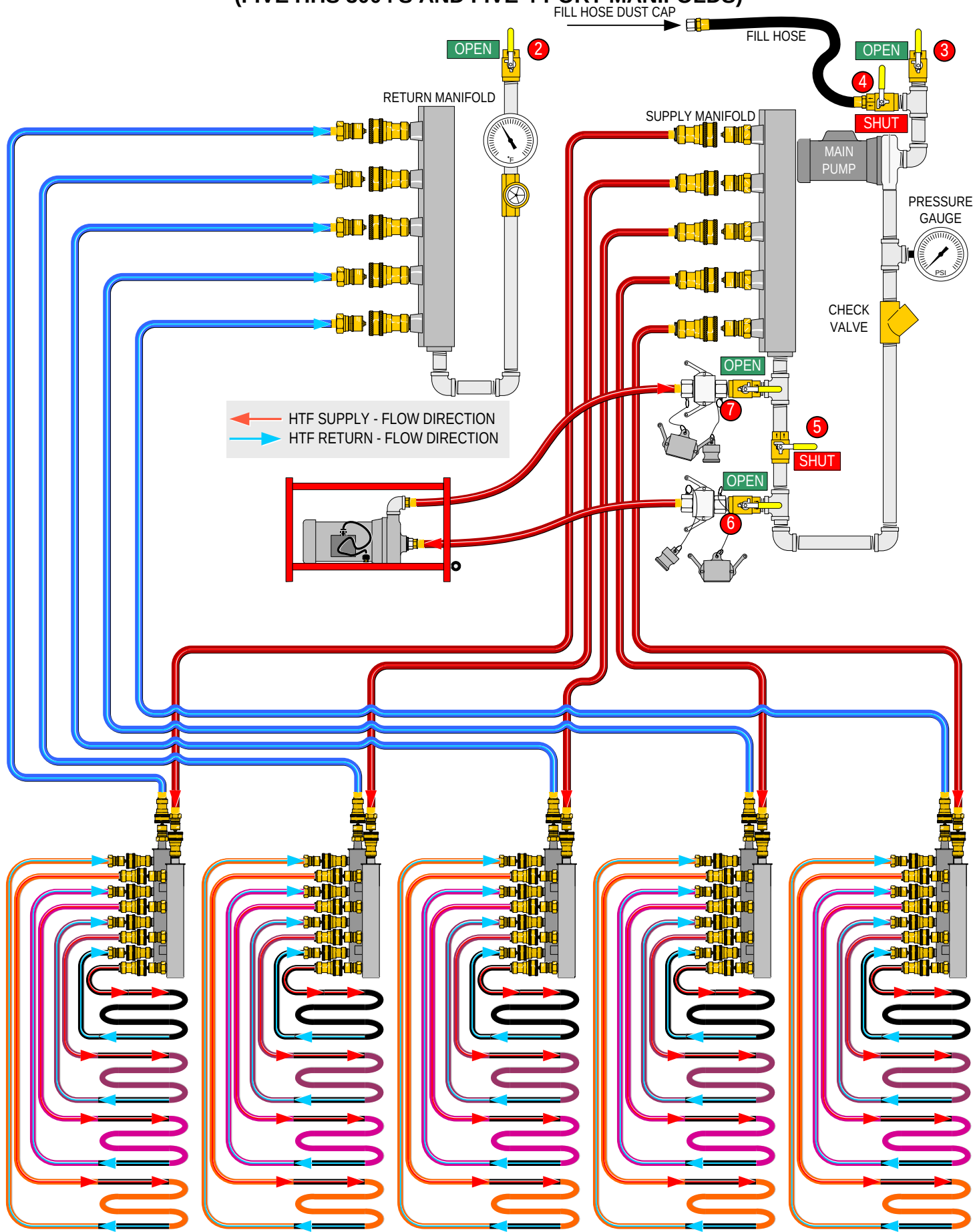
HX50 HEAT XCHANGER TO PUREHEAT CONNECTION LAYOUT



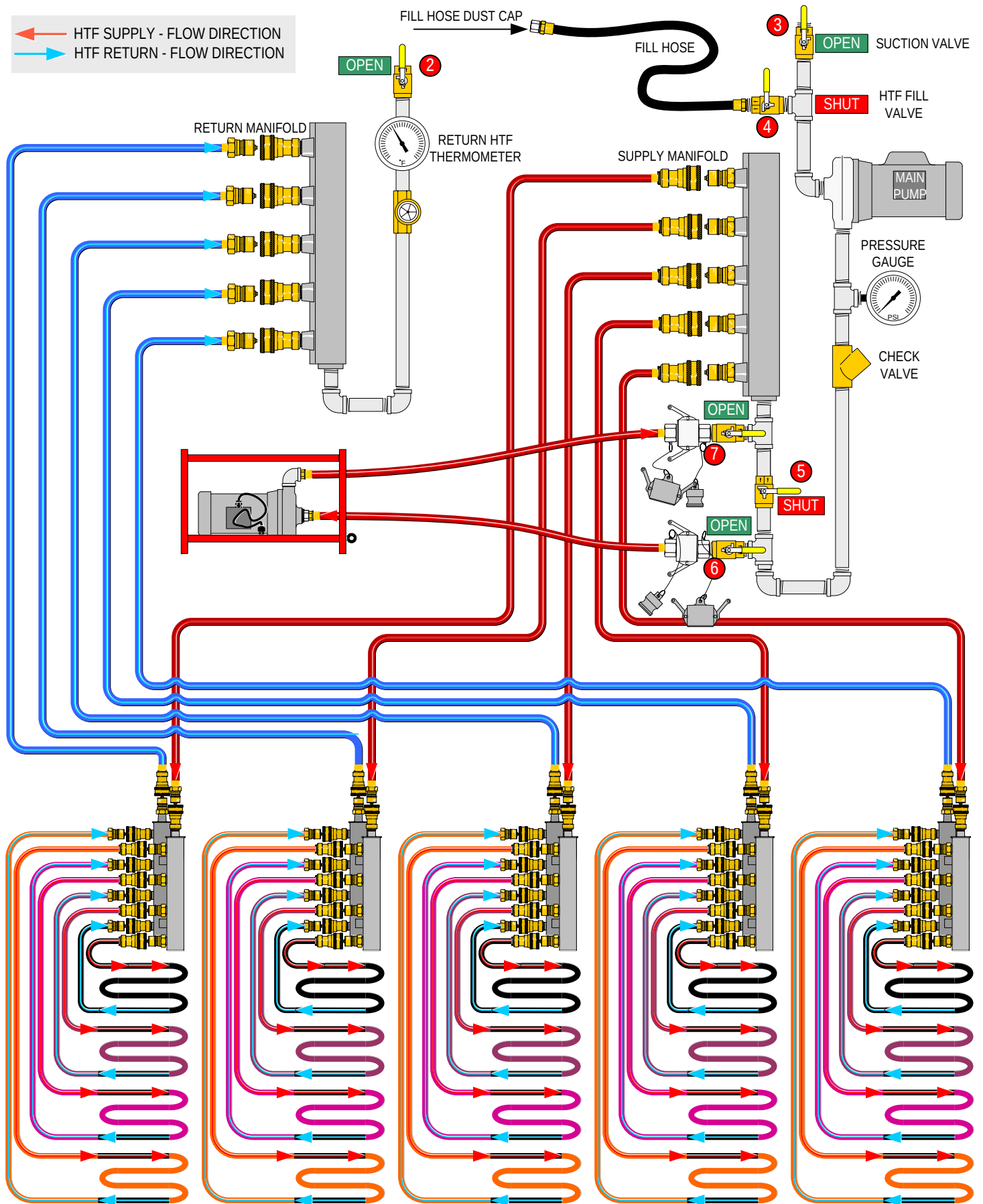
PUREHEAT 18,000 SQ. FT THAW LAYOUT (THREE HHS 3004'S AND THREE 4-PORT MANIFOLDS)



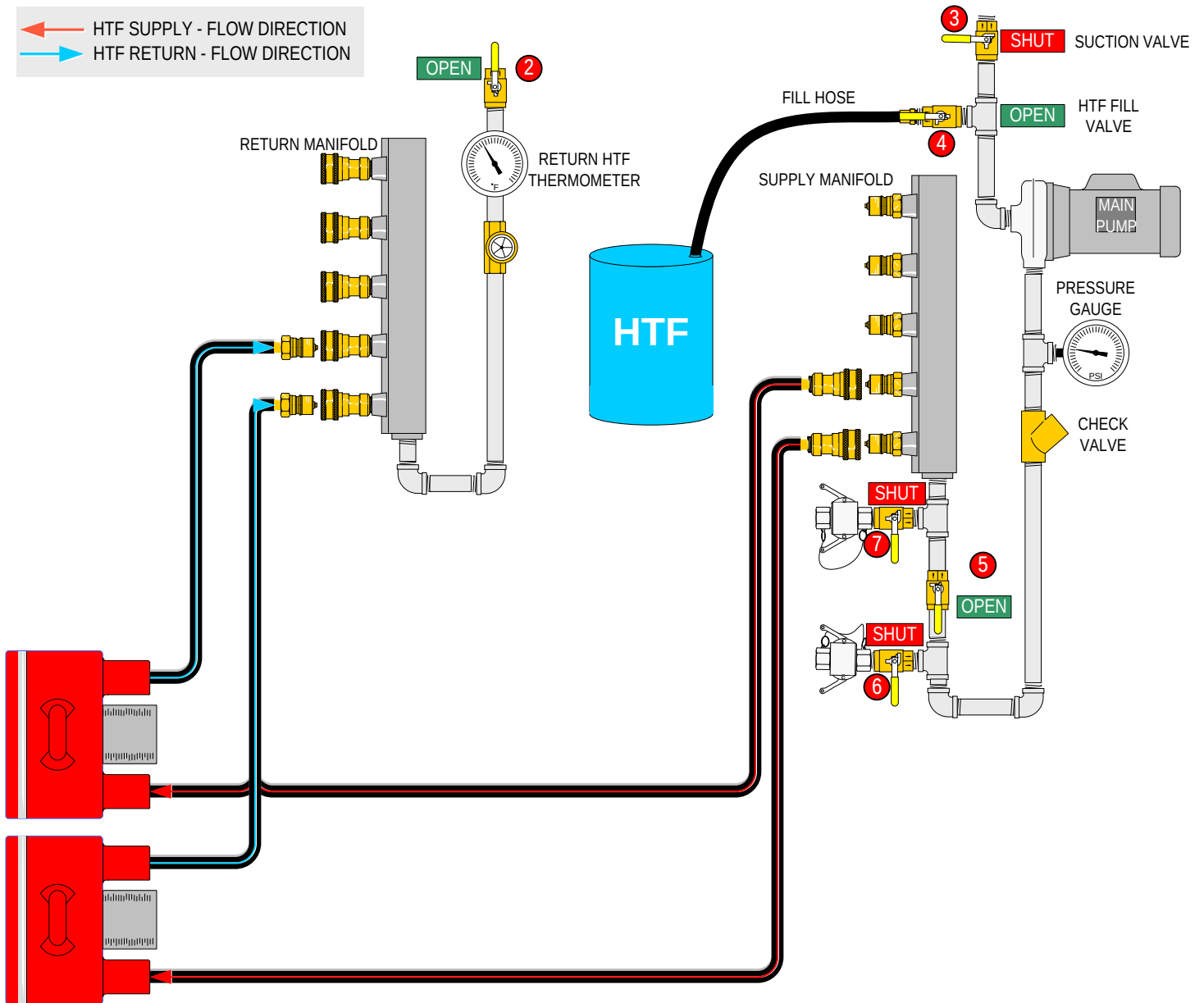
PUREHEAT 30,000 SQ. FT CURE LAYOUT
(FIVE HHS 3004'S AND FIVE 4-PORT MANIFOLDS)



PUREHEAT 45,000 SQ. FT FROST PREVENTION LAYOUT (FIVE HHS 3004'S AND FIVE 4-PORT MANIFOLDS)

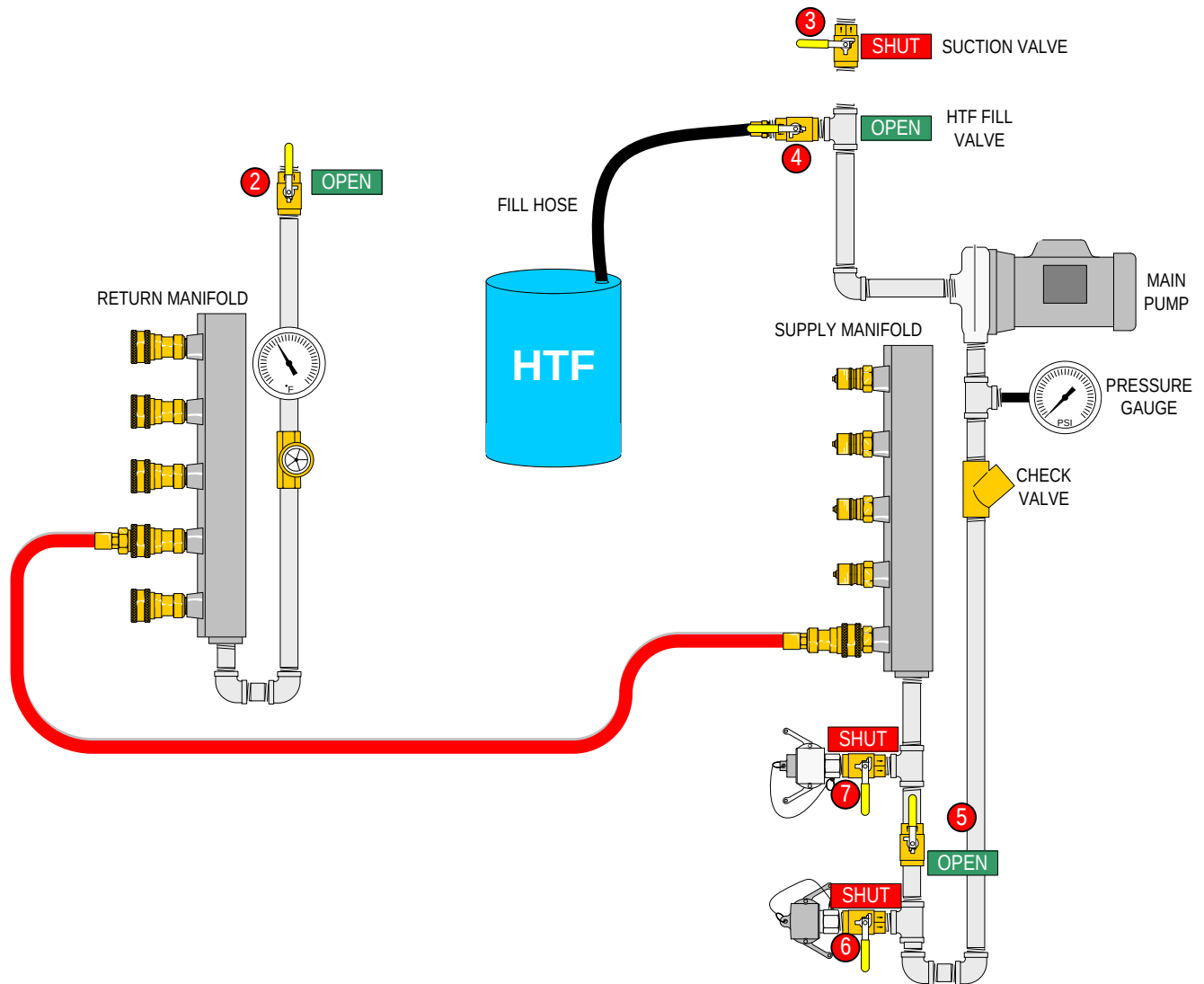


PUREHEAT VALVE POSITIONS FOR ADDING HTF (Machine in use)



1. Power up the PureHeat as described in section 2 of this manual.
2. Place the container of HTF near the access doors for the Hose Reel and the Main Control Panel.
3. Remove the Fill Hose from its storage location below the hose reel.
4. Clean the exterior of the Fill Hose and place the open end in the container of HTF.
5. It may be necessary to fill (prime) the Fill Hose prior to insertion into the HTF container.
This is accomplished by first lowering the hose near ground elevation and momentarily opening Valve #4 until HTF has filled the hose.
6. SHUT Pump Suction Valve #3
7. Pull the locking pin from Valve #4, pull the locking collar toward the handle and OPEN valve #4
8. If the LOW HTF LEVEL light is lit, push and hold the HTF FILL switch to operate the Pump.
If the LOW HTF LEVEL light is NOT lit, you may turn the pump switch ON to begin filling.
9. Continue filling until the HTF is observed in-between the LOW and HIGH marks adjacent to the HTF Sight Gauge. (photo 2-4, page 2.4)
10. Once filling is complete, pull the Fill Hose out of the HTF container with the Main Pump running to effect emptying the Fill Hose.
11. Shut Valve #4, ensure the locking collar slides toward the valve stem to the locked position, place the locking pin into the hole provided.
12. Turn the Pump Switch OFF.
13. Wipe down the fill hose and store it neatly below the Hose Reel.
14. Open Pump Suction Valve #3, check for leaks.

PUREHEAT VALVE POSITIONS FOR ADDING HTF (Machine not in use)



1. Power up the PureHeat as described in section 2 of this manual.
2. Attach a hose equipped with Quick-Connect fittings to the Supply and Return Manifold in order to provide a complete fluid path prior to adding HTF.
3. Place the container of HTF near the access doors for the Hose Reel and the Main Control Panel.
4. Remove the Fill Hose from its storage location below the hose reel and clean the exterior.
5. Prime the Fill Hose prior to insertion into the HTF container by lowering the hose near ground elevation, pull the locking pin out of Valve #4, slide the locking collar toward the handle, open the valve partially until HTF is observed filling the hose.
6. SHUT Pump Suction Valve #3
7. Attach a hose equipped with Quick-Connect fittings to the Supply and Return Manifold in order to provide a complete fluid path prior to adding HTF.
8. Pull the locking pin from Valve #4, pull the locking collar toward the handle, (unless it was done at step 5) OPEN valve #4.
9. If the LOW HTF LEVEL light IS ON, push and hold the HTF FILL switch to operate the Pump.
10. If the LOW HTF LEVEL light is NOT ON, you may turn the pump switch ON to begin filling.
11. Continue filling until the HTF is observed in-between the LOW and HIGH marks adjacent to the HTF Sight Gauge. (photo 2-4, page 2.4)
12. Once filling is complete, pull the Fill Hose out of the HTF container with the Main Pump running to effect emptying the Fill Hose.
13. Shut Valve #4, ensure the locking collar slides toward the valve stem to the locked position, place the locking pin into the hole provided.
14. Turn the Pump Switch OFF.
15. Wipe down the fill hose and store it neatly below the Hose Reel.
16. Open Pump Suction Valve #3, check for leaks.

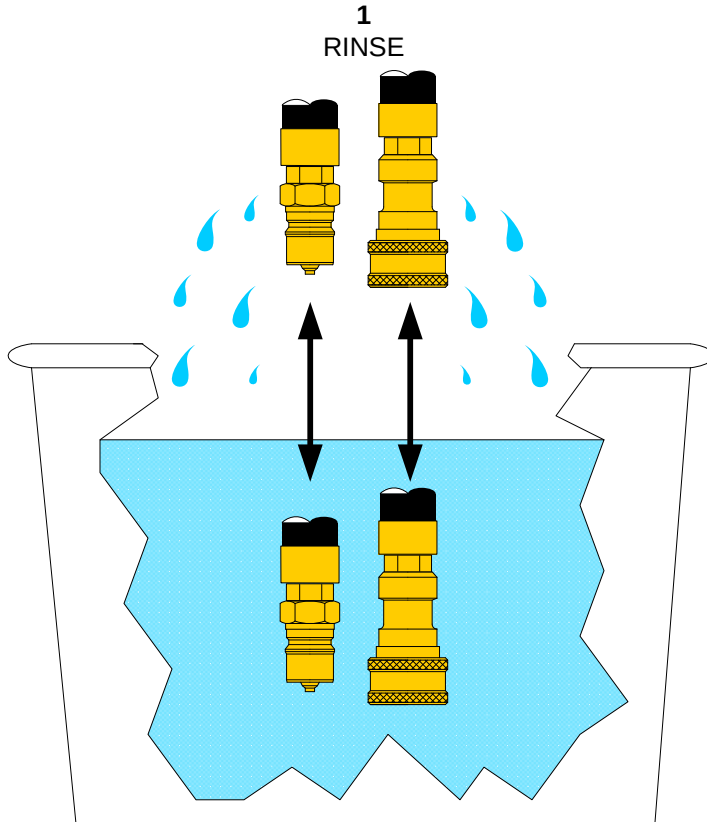
PUREHEAT QUICK-CONNECT AND CAM-LOCK CARE AND MAINTENANCE

ALWAYS:

- Keep connection devices free of sand and dirt.
- Rinse in clear water before and after each use.
- Inspect seals and gaskets before and after each use.
- Reinstall caps or protective covers after each use.

NEVER:

- Drop onto a hard surface such as concrete.
- Drive over with any size vehicle.
- Attempt to use damaged connection devices.
- Attempt to use when contaminated with soil, vegetation or any petroleum product.
- Attempt to use with damaged or worn seals or gaskets.
- Lubricate with petroleum products.

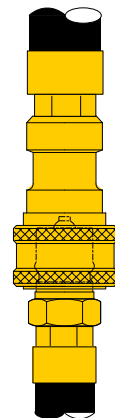


2
PUSH LOCKING
RING BACK

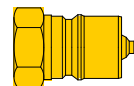


MALE QUICK CONNECT
(P/N M100-258)

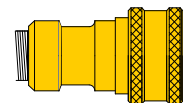
3
INSERT MALE
QUICK-CONNECT,
RELEASE LOCKING RING



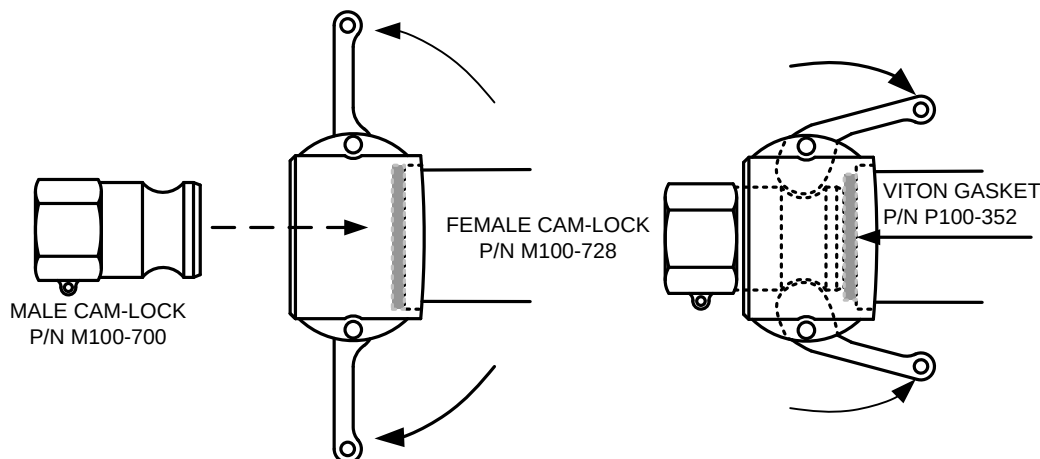
MALE QUICK CONNECT
(P/N M100-258)



FEMALE QUICK CONNECT
(P/N M100-259)



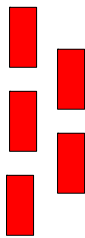
Unlock the Cam-Lock by swinging the locking arms outward. Insert the male fitting and lock by simultaneously swinging the arms inward as shown.



PUREHEAT APPLICATIONS AND CAPACITIES

(See Appendix pages B-1 – B-10 for accessories connecting)

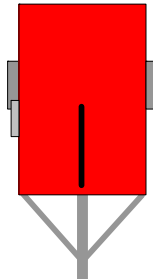
HX200



HX100



HX50



THAWING
N/A

CURING
N/A

FROST PREVENTION
N/A

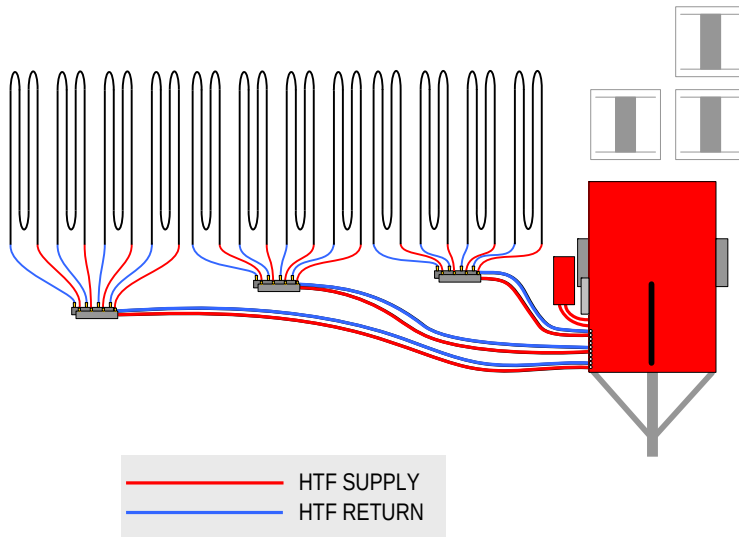
AIR HEATING
Up to: 1,200.00 ft³ (with Propane Fuel @ .6 BTU per ft³)

PUREHEAT, ONE Booster Pump, 3 HHS3004,
THREE Four Port Manifolds
(TWELVE 750 FT HOSE LOOPS)

THAWING
Up to: 18,000 ft² @ 24 in hose spacing

CURING
Up to: 18,000 ft² @ 24 in hose spacing

FROST PREVENTION
Up to: 18,000 ft² @ 36 in hose spacing



PUREHEAT, ONE Booster Pump, FIVE HHS3004,
FIVE Four Port Manifolds
(TWENTY 750 FT HOSE LOOPS)

THAWING
Up to: 30,000 ft² @ 24 in hose spacing

CURING
Up to: 30,000 ft² @ 24 in hose spacing

FROST PREVENTION
Up to: 45,000 ft² @ 36 in hose spacing

